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The Astronomical League

A New Associated Society of the American Association for the Advancement of Science

THE Astronomical League, established in 1946, is a federation of amateur astronomical societies. At present it numbers 77 clubs comprising more than 4000 members. Included in this membership are a few junior organizations, but many of the larger groups maintain junior membership in addition to the regular membership. Members-at-large are individuals living in communities that have no organized society; there are 20 such members, some outside the United States.

The aims and purposes of the League, as stated in the by-laws, are (i) to promote the science of astronomy; (ii) to encourage and coordinate activities of amateur astronomical societies; (iii) to foster observational and computational work and craftsmanship in various fields of astronomy; (iv) to correlate amateur activities with professional research.

The League publishes a *Bulletin* five times annually in which items of astronomical interest, as well as programing aids, are brought to the attention of members. An observing manual is in preparation; it will combine in one volume the suggested methods for accurately observing and reporting to appropriate agencies the principal astronomical objects visible with relatively small equipment.

There is a Junior Activities Section, which assists in the organization of junior clubs and coordinates the activities of junior members through the *Junior Astronomer,* published in 10 issues a year.

Additional sections provide assistance on instrumentation, group projects, and available astronomical films. A Book Service is maintained for the purchase of books at a discount for members.

In addition to its observational and organizational functions, the League promotes public interest in support of the relatively small number of professional astronomers. We believe that this contributes in no small measure to the growing public interest in the science and brings support to the work of professional astronomers.

Functionally, the League is divided into regions, each of which comprises one geographic portion of the country. Each region operates under an organizational structure similar to that of the national body. At present there are seven such regions functioning: Middle East, Mid-States, North Central, Northeast, Northwest, Southeast, and Southwest. A few member groups are outside the present regional boundaries.

The League holds an annual general convention, and each region holds its own annual regional convention. At these meetings, papers are presented by leading amateurs and professionals on various aspects of astronomy. Reports are made of the various observational programs carried on under the direction of section chairmen in conjunction with the national observing societies, such as the American Association of Variable Star Observers, the Association of Lunar and Planetary Observers, and the American Meteor Society. Proceedings of each general convention are published and are made available to members; they may also be purchased by interested individuals.

The site of the general convention is rotated throughout the regions. The 1954 convention will be held in Madison, Wis., July 2–5; plans are being made to observe the total solar eclipse of June 30 prior to the convention. In 1955 the general convention will be in Seattle, Wash.

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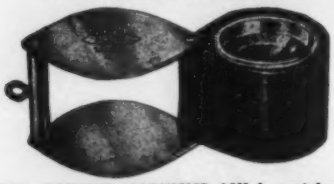

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Scientists in Communist China

Alfred Zee Chang*

215 C Street, S.E., Washington, D.C.

ALTHOUGH no leading Chinese scientist worked for the Chinese Communist Party (CCP) before 1948, following the accession of the Communists to power in China, all but a very few scientists remained to work under the Communist Government. A study of the present whereabouts of the directors of research institutes of the Nationalist Academia Sinica reveals that of the 13 directors, 10 are working for the Communists on the mainland of China. Several scientists with internationally known reputations, such as Dr. Hua Loo-keng (mathematics), returned to Communist China from the United States. Dr. Li Ssu-kuang (J. S. Lee, geology) returned from Britain in 1950, while Dr. Wong Wen-hao (geology) returned in 1951. This action represents a deplorable loss for the Chinese Nationalists, for the rest of the free world, and for the scientists themselves. Whether the hopes and aspirations of these scientists will be realized, even with their rigidly nonpartisan attitude, is a question yet to be answered.

While it is difficult to establish a standard of comparative value in discussing a nation's scientists, it is adequate to evaluate the leading scientists of China from their standings in various professional associations. Communist China has a united professional association for the natural sciences—namely, the All-China Association for Natural Sciences (abbreviated "Ko-lien")—having a national committee of 50 scientists (*1*). These 50 members are, of course, not the only outstanding scientists that China has produced. According to a preliminary survey by the Communist Academia Sinica, there are at least 233 who may be called experts in their own fields and probably 865 more who may be listed as potential experts. Of the latter group, 174 (about 20 percent) are overseas, mostly in the United States (*2*). In maturity of research and accomplishment, however, the 50 scientists of the "Ko-lien" National Committee are regarded in Chinese academic circles as masters in their own fields, and some are known internationally.

General Characteristics of Leading Chinese Scientists

Most of the "Ko-lien" group of 50 scientists are natives of the more westernized provinces of China. Of the 39 scientists whose native provinces can be identified, 10 are from Chekiang, and 9 from Kiangsu. This is in contrast with the sectional origins of the Communist leaders—that is, Central Committee members—who are mainly from hinterland provinces such as Hunan and Szechuan. Nearly all of this group of scientists have studied overseas, the majority in the United States. Of the 39 scientists about whose educations there is information, 23 were trained in the United States, four in Great Britain, three in Japan, two in France, and one in Canada. This is also in sharp contrast with the foreign-educated Communist leaders who were mostly schooled in the Soviet Union, France, and Japan.

Most of these scientists are old men by Chinese standards. The average age of the 33 in the aforementioned group whose age can be determined is 55.4 yr. The oldest is the 71-yr old Dr. Yen Fu-ching (M.D., Yale), and the youngest are atomic physicist, Dr. Chien San-chiang (Tsing San-tsiang, Ph.D., University of Paris) and the jet-propulsion specialist, Dr. Chien Wei-ch'ang (Chien Wei-zang), both young men of 42. There are nine in the 63–67 age group, 16 in the 50–57 group, and five in the 43–49 group. It is apparent that none is a product of postwar education. The last, Dr. Chien Wei-zang, graduated from the University of Toronto in 1942.

Upon their return to China from overseas graduate work, these foreign-trained scientists began teaching at universities, and some entered national research institutes, such as the Academia Sinica. Only one, Dr. Hou Te-pang (chemical engineering, M.I.T.), can be identified as having worked in private industry. The 36 scientists whose careers can be studied have spent an average of more than 15 yr in academic work. These are very stable careers for an unstable nation.

Most of this group of 50 scientists are sons of privileged families. Their overseas training was excessively costly, even for well-to-do families in China. Although most of them were sponsored by foreign funds, such as the Boxer Indemnity Fund, it was still a great burden for any family to send a son to a university (Tsinghua, Yenching, Chiaotung, or Peiyang) where foreign study scholarships were available rather than to a less expensive provincial college.

While these scientists, in most cases, were fortunate enough to have had family financial support while attending college, the competition of the entrance examinations for these universities was a test of their talent and scholarship. For instance, in the entrance examination of Tsinghua University in the 20's, usually only about 10 percent of the 1000 or so candidates passed. Most of the successful examinees were scholastic leaders of their high-school classes. Of the 50 members of the "Ko-lien" National Committee, 17 earned their Ph.D's. in the United States.

As a group, these scientists alienated themselves from political participation more than any other in-

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tellectual group. Only six of these scientists can be identified as having had Kuomintang (KMT, Nationalist) membership: Mao I-sheng (mechanical engineering, Ph.D., Carnegie Institute of Technology), Jen Hung-chien (physics, Ph.D., Harvard), Wu Yu-hsun (physics, University of Chicago), Chu Ko-chen (meteorology, Ph.D., Harvard), Chang Han-ying (civil engineering, Cornell University) and Chao Tsu-kang (electrical engineering, M.I.T.). The memberships of the last two were automatically imposed because of their official position under the Nationalist Government, while the other four, being presidents of national universities at one time or another, were perfunctorily invited to join the KMT or the KMT Youth Corps. On the other hand, only Tseng Chao-lun (chemistry, D.S., M.I.T.) can be identified as a bona fide leader of the pro-Communist Democratic League since 1947, while Liang Hsi (forestry, Tokyo Imperial University), Ping Chih (physics, Ph.D., Cornell University), and Yen Chi-tzu (physics, Ph.D., University of Paris) are now leaders of the Communist-approved political association, the Chiu San Society.

In material life, the leading Chinese natural scientists have been better off than their colleagues in the social sciences. It was much easier for natural scientists to reach full-professorship in the leading universities than it was for social scientists. A full professor in a national university, before the war, was paid annually about 2000 U.S. dollars (*3*). During the inflationary years of wartime and the postwar period, Chinese professors, while suffering more than most groups, received in kind about 200 catties of rice per month in addition to other family necessities, clothing, and living quarters. Professors in natural science were more liberally treated through awards of auxiliary research pay (*4*). While there are no official data concerning the remuneration of professors in Communist China at the present time, they are rumored to be no better off than under the Nationalists.

It is partially true that the leading Chinese scientists who were trained in "capitalist countries," according to Li Ssu-kuang's apologia to the Communists, made "a cult of individualism" and "considered the quest for abstract truth to be the sole purpose of their work (*5*). Contrary to Li's implication that Chinese scientists are lacking in patriotism, most foreign-trained scientists, upon establishing their fame in China, would deliberately remove the marks of "foreign orientation." On any Chinese college campus, people were surprised to discover that the most old-fashioned appearing scholars invariably had some achievements in foreign countries.

Present Occupations of Leading Scientists

After the reorganization of the Academia Sinica (the old Academia Sinica established by the Nationalists in 1928 should be literally translated as "Central Research Academy"; the present Communist organization should be translated as "Chinese Academy of Science"; but both are known by the name Academia Sinica), Marxist litterateur Kuo Mo-ju was appointed president of the Academia. Although trained in medicine in Japan, Kua never practiced his profession in China and may be regarded largely as a figurehead of the organization. Three of his five vice presidents are leading scientists—namely, Li Ssu-kuang, Chu Ko-chen, and Wu Yu-hsun. The other two vice presidents are Ch'en Po-ta, Mao Tse-tung's wartime private secretary, and social scientist Tao Meng-ho, former director of the Institute of Sociology under the Nationalist Academia. The last two have had little to do with natural science research. The administrative office of the Academia is in the hands of Dr. Yen Chi-tzu, and Yen's deputy, Communist Yun Tzu-chiang, former president of the "Academy of Natural Sciences" at Yenan.

Of the 11 institutes within the Academia, six are directed by leading scientists. These directors are Chien San-chiang in modern physics (atomic physics), Huo Loo-keng in mathematics, Li Ssu-kuang in archeology, Chien Tsung-shu (botany, Ph.D., Harvard) in systematic botany, Wang Chia-chi (botany, Ph.D., Pennsylvania) in hydrobiology, and Wu Hsueh-chou in applied physics. Three other directorships are held by scientists who are not members of the "Ko-lien" National Committee: Feng Te-pai in physiology and biochemistry, Pei Shih-chang in experimental biology, and Chao Chiu-chang in geophysics. One institute, geology, is without a director for the time being, but both of its vice directors, Cheng Yu-chi and Chang Wen-yu, cannot be identified as Communists. The only Communist scientist who is director of a division of the Academia is Lo Tien-yu, head of the Seed Selection Experimental Laboratory.

Most of these leading scientists retain their teaching positions while serving in government positions, such as on regional finance and economic committees or on cultural and educational committees. Of the 50 members of the "Ko-lien" National Committee, 15 retain full-time professorships, while five others serve on committees. Most of them probably have been incorporated into the faculty of Tsinghua University in Peking, for according to a recent report Tsinghua has now become the "Polytechnical Institute" which provides most of the engineers in China (total enrollment in 1952 was 3800) (*6*).

A few of these leading scientists hold key positions in functional departments; for example, Chang Han-ying serves as vice minister of the Ministry of Water Conservation, whose minister is a layman in this field, ex-Nationalist General Fu Tso-i. The American-trained bridge-building specialist, Dr. Mao I-sheng, who had taken part in almost all railroad-building projects under the Nationalist Government, is today the director of the Bureau of Railroad Research of the Ministry of Railroads. The most politically prominent figure among this group is probably agriculturist Liang Hsi, who was a supporter of the KMT when he was head of the Department of Forestry of the National Chekiang University before the war and is now the minister of forestry, Central People's Government.

The Communist members of the "Ko-lien" National Committee occupy mostly positions of an administrative nature in functional departments. Su Chiang-kuang, an old Red Army surgeon, who used to be the head of the Health Department of the People's Revolutionary Military Council (Red Army Headquarters), was appointed deputy minister of health. The head of Ministry of Health is Li Te-chuan, widow of the late Christian General Feng Fu-hsiang. Liu Ting, who was formerly the head of the Bureau of Arsenals of the Red Army, is now vice minister of the Department of "Second Machinery Manufacturing." Some of this group whose political affiliations before 1948 cannot be identified are probably Communists. Examples are Chang Ko-wei and Chen Kang-pai, who hold key positions in functional departments in Manchuria, and Wei Hsi (a graduate of Yale Medical College in China) who directed fieldwork in the so-called "International Scientific Commission for the Investigation of the Facts Concerning Bacterial Warfare in Korea and China," sponsored by the "World Peace Council" at Oslo in Mar. 1952. Wei later headed a "Korean Epidemic Prevention Corps."

Two younger scientists who were not Communists before 1948 presumably have been absorbed into the CCP. One of them is atomic physicist, Chien San-chiang, who worked under Mme. Irène Joliot-Curie in Paris for many years, and is now not only the head of atomic research in Communist China but also politically prominent on a national level. He is deputy chairman of the Communist functionary, the All-China Democratic Youth Federation. Chien is also active in Communist international parleys and accompanied the aforementioned germ warfare investigation commission from Europe to Peking. Another is a former jet-propulsion researcher at the California Institute of Technology, Chien Wei-zang, who is an elected deputy secretary-general of the All-China Democratic Youth Federation. He made a "cultural tour" to Burma in 1950, where he had no ties whatsoever, and on his return he was elected duputy chairman of the Chinese-Burmese Friendship Association.

On the surface, leading scientists with training in "capitalist countries" are still as dominant in every field as under the Nationalist Government. The contributions in most professional journals give the impression that the older generation still holds the lead in research, but the recent developments in China, especially in the wake of the "Anti-America-Aid-Korea Campaign," indicate that these leading scientists are being subjected gradually to as great pressure as any intellectual group. To understand the forces at work against these "bourgeois scientists" requires an analysis of the Communist policy and practice toward technical and scientific personnel.

Communist Policy and Practice toward Scientists

Before the Communists entered Peking in Jan. 1949, their preoccupation was with "political organization" and the Red Army; and the success of both relied almost solely on their "ideological work," while technical considerations came to their attention only when the Red Army needed such things as medical care and radio communications. The literature of the Long March, such as Edgar Snow's, describes the improvisations of the Communists in such matters. Even after the Communists were relatively settled in Yenan, it took them years to create any kind of scientific organization. The first medical training program was started with the establishment of the Eighth Route Army Medical School at Yenan in 1938, which in 1940 was renamed the China Medical College at Yenan. The "Academy of Natural Sciences" in Yenan, throughout its existence since 1940, was hardly more than a name.

The inability to establish a program of scientific development does not mean a complete unawareness by the Communists of the potential of technology. As early as the beginning, in 1930, of the Nationalist suppression campaign in Kiangsi Province, the Communists advertised the policy of special treatment for, or "do honor" to, technical and scientific personnel, in the event that they wanted to join the Communists. The first official decision of the Communists with regard to the importance of the participation of technical personnel in their "revolutionary activities" was indicated by an announcement of a Central Committee resolution dated May 1, 1941 (7). In this resolution, the Communists declared: "We must explain to the whole party that various types of economic and technical work are an indispensable part of our revolutionary activities." Meanwhile, in the adoption of this policy, the Communists emphasized, "the party must strengthen its leadership among party and non-party members who participate in economic and technical work, and promote their progress in political training." Here is found the early expression of the Communist political indoctrination of technical personnel.

Throughout World War II, however, there was no sign that the Communists made any progress in training or absorbing scientific personnel. The reasons for this condition were, first, that most of the youths who went to Yenan were persons with only high-school education or less, and their main interest was to join in army work. The leading scientists had alienated themselves from political participation; Yenanese adventure for them was unthinkable. Second, the average Communist leader was not only preoccupied with army work but possessed the traditional suspicion of the Chinese farmer toward technical progress. While high Communist leaders stressed the importance of technology, it is doubtful that the Communists had the same enthusiasm and determination for attacking technical problems as they had in other fields. The reluctance of Communists to undertake technical problems is reflected in this passage from the 1941 resolution (7):

> Some party organizations and party members who possess only a narrow and abstract understanding of our revolutionary work, or even look down on eco-

> nomic and technical work, considering it to be without serious political significance, should be corrected in their error. The tendency to use ideological studies as an excuse for not participating in practical work should be corrected.

It should be pointed out that Yenan was no more jeopardized in wartime than Chungking, Kweiyang, or Kunming, where most high-educational institutes took refuge during the war. The Communists had access to equipment and opportunity to enlist personnel for basic scientific training, but they did not make serious efforts to launch any commendable scientific study.

The overemphasis of political training in Yenan, moreover, gave no room for any serious scientific study. Communist leaders, as well as party cadre, were preoccupied with daily political lessons and discussions and seldom could find time to give serious thought to any long-range training program in science. The decision to make use of technology in their struggle for political dominance finally came at a time when the Nationalist economic blockade had impoverished Yenan; it thereby grew out of a primary economic necessity. Yenan and the surrounding area are extremely arid and unproductive, but the Communists were incapable of facing even this problem from a scientific approach. They entered the field of agricultural improvement by utilizing political weapons, such as the so-called "Wu-Man-Yu Movement" (a counterpart of the Soviets' Stakhanov Movement of the 30's) to solve a problem purely materialistic in nature.

The inability to train or absorb scientific personnel during the first 28 yr of the CCP was, thus, due to the temper of Communist leaders. The priority of political indoctrination of non-Communists was insisted upon even during an adverse time, such as 1939–1941. Today, they have become the *de facto* rulers of the China mainland, and having the advantage of obtaining scientific cooperation from the Soviet Union, it seems unlikely that they would yield ground to scientists merely because of the reconstruction program.

At first, the symptoms were encouraging to most scientists. When the Communist rule became effective, they advertised, on various occasions, their special treatment toward scientists, which proved to be a phenomenal success for the Communists in persuading leading scientists to stay or return to the mainland. In the Common Program of the Chinese People's Political Consultative Conference (the body that nominally established the present Communist regime), for instance, the love of science was one of five "virtues," as was the promotion of these leading scientists politically. Of the 50 scientists under discussion, 18 (including two Communists) were rewarded by appointment to the Conference, a higher proportion than from any other profession. The budget covering expenditures in scientific research in the first year of the Communist rule was reportedly double the Nationalist prewar allocations for the same purpose (*8*). Mao Tse-tung emphasized the importance of technical and scientific research in his *"On People's Democratic Dictatorship"* in commemoration of the 28th anniversary of the CCP (*9*):

> We must overcome all difficulties and learn the things we do not understand. We must learn to do economic work from all who know, no matter who they are. We must respect them as teachers, learning from them attentively and earnestly.

Since the "Anti-America-Aid-Korea Campaign" and later "Anti-Three and Anti-Five Movements," leading scientists in China have been treated ruthlessly in certain isolated cases. Self-criticism and ridiculous confessions have been written by scientists and made public in newspapers. At least one outstanding scientist, Chicago-trained Dr. Lo Chih-wei, was definitely liquidated in Mar. 1952, because of his refusal to sign an anti-American declaration. On the China mainland today this ordeal happens to all non-Communist intellectuals. It is not the intention here, however, to detail the ubiquitous "brain-washings." The most serious challenge to these scientists—a challenge to truth itself on which these men have built their lives—is the particular Communist concept of science in general and their inherent antagonism against "bourgeois science" in particular.

Michurinism is now the canon of science in Chinese Communism. The Communists worship the Russian horticulturist in a way the Chinese used to do honor to Confucius. There are Michurinian associations and experimental stations throughout the China mainland, and the practice of Michurinism is not confined to biological science alone. It is understandable in the Western world that when Michurinists are dominant, the usefulness of modern scientists is doomed. Paralleling this concept has been a growing atmosphere of incredible helplessness and acceptance of authority in Chinese scientific professions. A few examples may be cited:

1) In the All-China Conference of the Society of Mathematics, under the leadership of Dr. Hua Loo-keng, only three topics were discussed: "How to realize patriotism through education in mathematics"; "The connections between theory and reality"; "Dialectic materialism and mathematics" (*10*).

2) The National Conference of the Society of Meteorology, under the leadership of Dr. Chu Ko-chen, made a "concrete" resolution to "inform all workers in the field of meteorology that they should learn from Chairman Mao's *On People's*" (*11*).

3) In the National Conference of the Society of Chemistry, Dr. Tseng Chao-lun, president of the society, confessed that in error the society had adopted the Anglo-American system in the past, and that the reorientation of study, starting with the compilation of a chemistry dictionary, was the most important problem at hand (*12*).

Direct attacks against the usefulness of "bourgeois scientists" have been visible since 1952. An article from *People's China* (*13*) (in English) reveals the spirit of the time.

The Yellow River Bridge, three kilometers in length, is of vital importance to the Peking-Hankow Railway. Bourgeois engineers considered that on account of its age, it should be dismantled and rebuilt. But Zingorenko, a 60-year old Soviet railway expert, examined the spans one by one and advised that the bridge was serviceable and needed only to be strengthened. The suggestion of the Soviet expert was adopted, the speed of train crossing the bridge is now twice as high as before. The load which the bridge can support is also twice as great as before.

When repairing a certain bridge on the Canton-Hankow railway, Chinese engineers were going to follow the American standard of putting four steel beams in each span. It was the Soviet experts, who, realising that China was short of steel, made minute examinations and calculations and proposed to use two beams instead of four. This represented a huge saving with no loss in safety.

In main construction projects, the Communists rely more on their ability and ruthlessness in organizing masses than on technical know-how. In most cases, the Communists have conspicuously deprived the established experts of their share in major events in the nation. The Huai River Project, which the Communists claim as one of the "greatest epics of modern time," is headed by a Communist Central Committeeman and one-time head of the secret police, Tseng Shan, aided by another Communist guerrilla leader, Tseng Hsi-sheng, a graduate of Whampoa Military Academy and a division commander of the ill-fated New Fourth Army during the war. The Tsengs mobilized, between 1951 and 1952, 4,600,000 workers and peasants in this project (*14*). Here is found an expression of the idea that Communist activity cannot be entirely separated from the Communists' experience in military tactics, from which most of their education was derived. It is no doubt appalling for those "bourgeois scientists," remaining inactive, to watch the wastefulness of the Communist military tactics of "human sea waves."

It is apparent that the Communists have little appreciation of the talents and ability of leading scientists. In fact, these scientists, with their objective method of reasoning, represent a potential threat to Communism. All that stands between the scientists and their eventual euthanasia at the hands of the Communists is their immediate usefulness in technical matters and their congenital nonaggressiveness. Indigenous technology and the scientific approach on the China mainland is in a highly static condition today, and the future of science in this area presumably will be that contained within the general Soviet scientific pattern.

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Bienvenido Maria Gonzalez: 1893-1953

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ON December 30, 1953, death claimed Bienvenido Maria Gonzalez, retired president of the University of the Philippines, at the age of 60, in the San Juan de Dios Hospital in Pasay City. In his death, the Philippines lost a renowned educator, administrator, and scientist.

From his father, Bienvenido acquired an early interest in science and administration. His father was a physician, an eye specialist, and president of the short-lived Universidad Literaria de Filipinas, the first state university in the Philippines during the revolutionary period. His father was also the first director of the civil service appointed by the first governor general of the Philippines, William Howard Taft.

After finishing his elementary education in Manila, Bienvenido attended the College of Agriculture, University of the Philippines, Los Baños, Laguna, where he received the degree of bachelor of agriculture in 1913. In 1914, he was sent as a fellow of the University of the Philippines to the University of Wisconsin. He studied animal geneties under Professor Leon J. Cole and received the degree of master of science in 1915. Returning to America in 1921, he studied at Johns Hopkins University under Professor Raymond Pearl, biometrist, and received his degree of doctor of science in 1923.

His great energy and intensity of purpose enabled Dr. Gonzalez to carry on simultaneously his activities as organizer, administrator, and scientist. As professor of animal husbandry, then dean of the College of

Agriculture, and finally president of the University, Dr. Gonzalez raised the standard of the institution to a high plane. A nonbeliever in the idea that Philippine livestock can be improved through the costly importation of standard improved breeds of animals from temperate countries, Dr. Gonzalez has to his credit the development of the Berkjala breed of swine, the Los Baños Cantonese chicken, and the Philamin breed of beef-draft cattle, in addition to a large number of published contributions. He was responsible for the transfer of the University from Manila to Diliman. Owing to his character and his unflinching attitude in a fight for principle, he created enemies but endeared himself to his numerous friends and admirers, colleagues, and students. His fight against the encroachment of politics in the University ended in his untimely retirement from its presidency.

In the College of Agriculture, Dr. Gonzalez became assistant instructor in animal husbandry on December 13, 1913, and then was promoted through successive grades until, in 1923, he was made head of the department. He was appointed acting dean in 1927, and permanent dean the following year. He was the first Filipino and alumnus of the College to occupy this position, which he held until he was appointed president of the University.

At 25, Dr. Gonzalez was the first alumnus regent of the University of the Philippines. He served in this capacity from 1918 to 1921. His appointment to the presidency of the University on April 29, 1939, made him the first alumnus and scientist to become president of the institution. And, at 46, he became the youngest incumbent for the longest period (except during the Japanese occupation) until his forced retirement on April 22, 1951.

Dr. Gonzalez was a member of a large number of organizations. He was a fellow of the AAAS, 1934; vice chairman of the National Research Council of the Philippines, 1934–1935, 1937, chairman from 1938 until his retirement in 1951; and president of the Society for the Advancement of Research in 1935–1936. He held many positions of trust in a large number of public, private, industrial, commercial, and agricultural organizations too numerous to list here.

President Gonzalez was born on March 22, 1893, in Apalit, Pampanga. He was the son of Dr. Joaquin Gonzalez, of Baliwag, Bulacan, and Florencia Sioco Gonzalez, of Bacolor, Pampanga.

On January 1, 1917, Bienvenido Maria Gonzalez married Conceepcion Rafols, of Cebu, who survives him. Surviving him also are their five children: Manuel, married, an engineer; Gonzalo, a lawyer; Eva, an instructor in the department of home economics of the University of the Philippines; Lilia, a student in the Conservatory of Music; and Bienvenido, a student in the College of Business administration.

Endocrine Regulation of the Capillary Resistance*

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THE capillary resistance—that is, the capacity of the capillary wall to resist intracapillary pressure or extracapillary suction—was considered heretofore as a local phenomenon, and the factors influencing it were thought to act only locally. Clinical and experimental work done by three research groups during the last 3 yr has brought convincing evidence that capillary resistance is subject to endocrine control. It is of interest that the three research groups have been working in three countries along three different lines.

Robson and Duthie in England found on the basis of clinical observations a direct relationship between capillary resistance and adrenocortical activity. They postulated that cortisone is responsible for this relationship (*1, 2*). Eichholtz, Staab, and Taugner in Germany made a pharmacological study on cortical extract and claimed that desoxycorticosterone is engaged in the control of the capillary resistance (*3*).

The starting point of our work was different. While studying the effect of various forms of stress (cold, forced muscular exercise, prolonged fast, trauma, ether anesthesia, severe emotional upset) upon the capillary resistance of the albino rat, a typical change was found consisting of four phases: (i) initial rise, (ii) sudden drop, (iii) a period of pathologically low level, (iv) gradual restoration to normal. The entire phenomenon, the second and third phases of which were termed *capillary crisis*, lasts approximately 1 mo. The fact that this capillary response was found to be

* This work represents part of a project supported by the Division of Research Grants of the U.S. Public Health Service and by The Creighton University School of Medicine. Read at the XIX International Physiology Congress, Montreal, Canada, Sept. 1953.

rather uniform, irrespective of the type of stress applied, suggested a uniform and nonspecific underlying mechanism and prompted us to study the pituitary-adrenocortical system. In the course of this study, it was definitely proved that the adrenal cortex is intimately connected with the resistance of the capillaries and that cortisone is involved in this function (*4–8*).

An analysis of the capillary crisis elicited by stress showed that cortisone, but not ACTH, is capable of preventing the crisis; hence, it was concluded that capillary crisis cannot be the result of a decreased discharge of ACTH but rather may be due to primary adrenocortical hypofunction. This was demonstrated also by means of Thorn-tests (*9*). Here, however, the following discrepancy was encountered. Whereas the Thorn-test was usually found negative in the first part of the capillary crisis, it soon became positive, often *at a time when the capillary resistance was still extremely low*. Because of this, it was thought possible that another hormone may antagonize cortisone during the later part of the stress response.

In search for an antagonizing hormone, desoxycorticosterone (acetate, aqueous macrosuspension, Bell Pharmaceutical Co.) and the sex hormones (Testosterone Propionate, White Laboratory; Diethylstilbestrol, Lilly) were tested and found ineffective. Next the somatotropic hormone was considered.

Forty mature albino rats (Sprague Daily strain) of both sexes weighing 200 to 300 g and fed Purina Dog Chow were used. Twenty-three of them had been adrenalectomized at least 2 mo prior to the experiments. All animals were carefully trained so that the handling and restraint required for the measurement of the capillary resistance engendered minimal emotional stress. The negative pressure method was used for testing capillary resistance. Our device consisted of a vacuum reservoir that was connected to an electrically powered suction pump in one direction and to a small plastic bell (of an inner diameter of 7 mm) in the other direction. The degree of suction was measured by an intercalated mercury manometer. The test was performed on the abdominal skin surface of the animals. Suction was employed for 60 sec. The least negative pressure (suction) measured in centimeters of mercury, capable of producing one or more punctiform bleedings was taken as the value of capillary resistance. (For details of technique see references *4, 6*.)

When intact rats were given STH (SomaTrofin, Horner Ltd., Montreal, lots No. C-35-39-J and C-35-42-D), the capillary resistance was found to decrease considerably within a few days. When STH was discontinued, the capillary resistance returned to normal. A technical difficulty was, however, encountered in these experiments. Since rats seem not to be very sensitive to STH, relatively large daily doses (2 to 4 mg/100 g body weight) had to be administered. These amounts, when given subcutaneously, showed poor absorption, and gave rise to localized edema. Thus, since daily intramuscular injections also proved impracticable, the intraperitoneal route was chosen. Control experiments showed, however, that any intraperitoneal injection, even that of physiologic saline, may represent a stress and elicit a capillary stress response with its typical four phases as described in a foregoing paragraph. This interfering reaction could not be prevented, even with the most careful previous training of the animals.

The difficulty was overcome in the following way. One group of rats consisting of three trained animals with well-established control level of capillary resistance was given daily intraperitoneal injections of 1 cc physiologic saline (group A). A second group of three similarly prepared rats received the same amounts of saline with STH (group B). The two curves in Fig. 1 represent average values of capillary resistance of these two groups of animals. Group A upon receiving intraperitoneal saline injections alone disclosed a crisis and a prompt restoration of capillary resistance to normal—that is, a typical stress response. No restoration occurred in the animals of group B receiving STH in the same amount of saline. The difference between the two groups was very striking between the 20th and 22nd days of the experiment. The capillary resistance of group A was above 60 cm Hg, whereas that of group B was below 10 cm Hg. On the 23rd day of the experiment, the treatment of the two groups was reversed: group A received the daily injections of STH and group B those of physiologic saline. The result was very spectacular. Whereas the capillary resistance in group A precipitously dropped, that in group B gradually increased to the maximum measurable height. A second administration of STH to group B resulted in a repeated decrease of capillary resistance close to zero level.

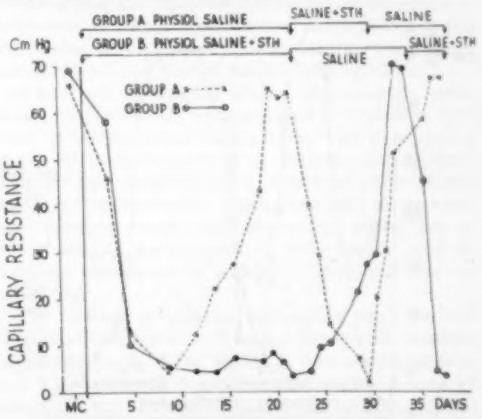

Fig. 1. Effect of somatotropic hormone upon capillary resistance of the normal female rat. Each curve represents the medium capillary resistance values obtained in one group of three rats. Daily intraperitoneal injections of 10 mg STH in 1 cc physiologic NaCl and 1 cc physiologic NaCl without STH were given alternately to these two groups of animals. *MC* = mean value of capillary resistance during control period.

The question arose whether this effect of STH is mediated through the adrenal cortex (by interfering with cortisone elaboration) or occurs because STH antagonizes cortisone at a more peripheral (target organ) level. The following two groups of experiments were made to decide on this question.

1) Female adrenalectomized rats were treated with cortisone. The capillary resistance rose. When STH was added to cortisone, it promptly decreased. When STH was stopped and cortisone was given alone, the capillary resistance again increased (Fig. 2).

2) Female adrenalectomized rats were given cortisone conjointly with STH. Cortisone failed to raise capillary resistance; the rise came only when STH was discontinued (Fig. 3).

The results indicate that the effect of cortisone upon the capillary resistance is antagonized by STH at a peripheral level *without the mediation of the adrenal cortex.*

It was noticed in some experiments that STH also counteracted the cortisone effect on the weight of the animals (Fig. 2) and the number of circulating eosinophils (Fig. 3), although this action was by far not so consistent as that upon the capillary resistance. It should be mentioned that whereas STH readily decreased the capillary resistance of the intact (non-adrenalectomized) rats of both sexes, its antagonizing effect upon cortisone in the adrenalectomized animals was less pronounced in the male. The cause of this sex difference is the subject of current work.

While other factors are undoubtedly involved, these observations show that the resistance of the capillaries depends to a great extent on the combined and antagonizing effects of cortisone and STH. Thus the level of the capillary resistance may reflect the actual bal-

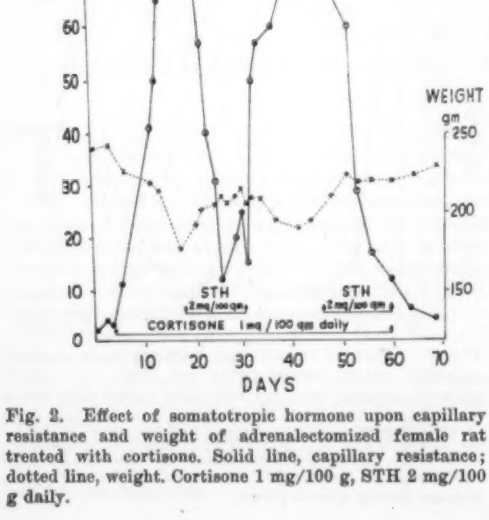

Fig. 2. Effect of somatotropic hormone upon capillary resistance and weight of adrenalectomized female rat treated with cortisone. Solid line, capillary resistance; dotted line, weight. Cortisone 1 mg/100 g, STH 2 mg/100 g daily.

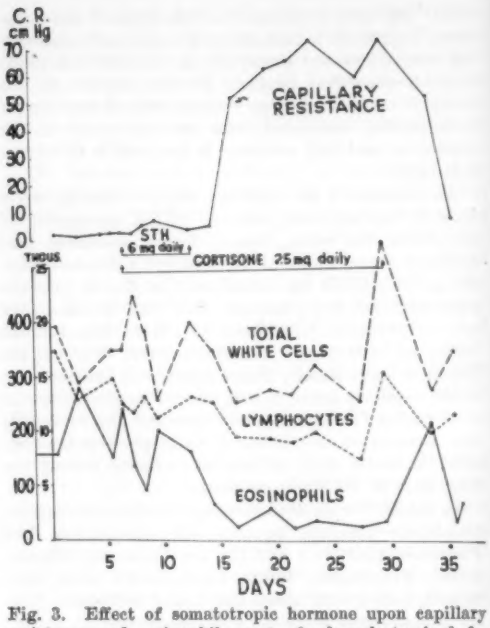

Fig. 3. Effect of somatotropic hormone upon capillary resistance and eosinophil count of adrenalectomized female rat. Cortisone 2.5 mg daily; STH 6 mg daily.

ance between these two hormones. It is believed that these observations may have twofold significance. Directly, they contribute to our knowledge of the mechanism that controls the capillary resistance. Indirectly, capillary resistance, when used as a tool, may give us insight into the relationship that seems to exist between cortisone and the somatotropic hormone. In fact, since the new aspect of this test became obvious, it has been employed by another research group of this school (C. M. Wilhelmj and associates) working on other objectives with endocrine relation and found very useful, permitting more insight into the endocrine functions when applied with other methods (*10*). In their experiments in progress, the same antagonistic action of cortisone and STH upon capillary resistance that was found in the rat was demonstrated in the dog. The dog even proved to be a better test object, because of its apparently greater sensitivity to the somatotropic hormone.

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News and Notes

Meeting of Society of Exploration Geophysicists

Approximately 1000 members of the Society of Exploration Geophysicists attended its 24th annual meeting in St. Louis, Apr. 12–15. The SEG met jointly, as usual, with the American Association of Petroleum Geologists and the Society of Economic Paleontologists and Mineralogists; the three organizations held simultaneous sessions in the Kiel Auditorium. The large convention hall and the corridors surrounding it were filled with exhibits, sponsored by both commercial and educational organizations.

The Society of Exploration Geophysists is concerned primarily with the exploration for petroleum and minerals by geophysical methods. Papers presented at the meeting were devoted both to basic research in the sciences on which these methods depend and to new developments and improvements in geophysical techniques. Although the interests of the membership have always been strongly concentrated on geophysics as a tool for petroleum exploration, increased attention has been devoted in recent years to mining geophysics. Therefore two sessions, involving a total of 16 papers, were given over to this subject.

Of all the current developments in geophysical prospecting techniques that were discussed at the meeting, the magnetic recording of seismic reflection signals seemed to excite the greatest interest. Four papers on the technical program were devoted to this subject; many of the exhibitors demonstrated their current models of field equipment for tape recording and playback. The conventional method for recording the seismic reflections resulting from shot-hole explosions involves photographic registration of light beams on moving paper; these beams are reflected from galvanometer mirrors, each trace on the final record corresponding to a separate geophone channel through which only a narrow band of frequencies has been admitted. Multi-channel magnetic tape has the advantage of recording a much wider band of frequencies, and any desired frequency band can be chosen for the final paper record, which is made later upon playback of the tape. Seismic signals on magnetic tape are much more suitable than those on paper records for automatic computing operations, which often are desirable for improving data quality.

Roland F. Beers of Beers and Heroy discussed the problems involved in standardization of magnetic tape recording and also outlined the various computing procedures that could be applied to seismic data after magnetic recording. Raymond A. Peterson of United Geophysical Company spoke on the practical aspects of magnetic recording based on the 2-yr field experience his company had gained with tape equipment. C. C. Lash of the Stanolind laboratories described a special magnetic tape playback system, devised by himself, T. H. Gilmartin, and J. D. Eisler, that compounds signals from adjacent geophone groups with a variety of predetermined time delays between the adjacent channels. The purpose of this device is to discriminate between seismic waves on the basis of the direction of arrival of the wave rather than on the basis of frequency, as is usually the case in conventional recording.

A novel method for measuring the earth's magnetic field using nuclear magnetic resonance was described by Martin Packard of Varian Associates. The technique requires measurement of the precession frequency of polarized protons in the earth's field. The measurement requires about 15 sec and is said to give the absolute value of the earth's field with an accuracy of 0.5 gamma. Although the accuracy of this method for differences in field from one place to another is not substantially greater than that of standard magnetic prospecting techniques, it makes possible a highly precise determination of the absolute value of the earth's field. No other method gives this information with such precision.

A geophysical survey conducted last year in the Gulf of Mexico shows that the southern half of the Gulf is a typical ocean basin, according to Maurice Ewing, J. L. Worzel, D. B. Ericson, and B. C. Heezen of Lamont Geological Observatory, Columbia University. Seismic refraction data obtained on the Lamont expedition indicates that the base of the earth's crust is only 16 km deep below this portion of the Gulf basin. In continental areas the crust is considerably thicker. Another paper from Lamont, by J. E. Oliver, Frank Press, and Maurice Ewing, described some experiments in which seismic wave propagation in the earth was advantageously studied with "two-dimensional" metal and plastic models 1/16 in. thick.

A new tool for logging density of formations penetrated by a bore hole was described by Daniel Silverman of the Stanolind laboratories, who presented a paper by G. R. Newton, J. E. Skinner, and himself. This device, consisting of a source of radioactivity and a radiation counter, makes use of the correspondence between density and gamma-ray absorption in rock materials. An accuracy of 0.05 g/cm^3 is claimed, although unevenness in bore-hole diameter lowers the reliability.

The mining geophysics symposium was devoted largely to case histories of actual surveys for minerals in various parts of the world. A most successful survey was conducted recently in the Bathurst area of northern New Brunswick. Here the electromagnetic and self-potential methods were responsible for the discovery of three large lead-zinc-copper ore bodies. Papers by H. O. Seigel and S. H. Ward described the investigations leading to these finds.

MILTON B. DOBRIN

Magnolia Petroleum Company, Dallas, Texas

Science News

A **supernova** has been discovered with the 18-in. Schmidt telescope at the Palomar Observatory by Paul Wild of the California Institute of Technology. This is the first supernova found by Palomar since Mar. 20, 1950, when Milton L. Humason observed one in the galaxy known as IC 4051 in the constellation of Coma Berenices. This new find of Wild's appeared in a faint spiral galaxy, known as NGC 5668, in the constellation of Virgo. Spectroscopic studies made by Dr. Humason with the 200-in. Hale telescope show that it is a Type I supernova, which is about six times as bright as a Type II and exhibits certain spectral differences. In an 18-in. Schmidt exposure made 3 yr ago, no stars were visible in NGC 5668. Because of its great distance, this galaxy appears only as a blurred area on the film.

From a systematic search for supernovae made in the 1930's, it was estimated that in an average galaxy a supernova may appear once every 500 yr. No supernovae have been found in our own galaxy, the Milky Way, since 1604, when one was observed by Johannes Kepler. "Kepler's nova," as it is called, was for some weeks as bright as the planet Jupiter and remained visible for about 2 yr. "Tycho's star," which appeared in 1572, was visible to "persons gifted with good sight" at daylight, even at noon, when the sky was clear, according to a report by its discoverer, Tycho Brahe. The first supernova known in our galaxy was observed in 1054 by Chinese who called it a chi-ch'ou, or "guest star."

Dirk Brouwer, director of the Yale University Observatory, and Jason J. Nassau, director of the Warner Swasey Observatory at the Case Institute of Technology, under travel grants from the National Science Foundation, participated in an international astronomical meeting in connection with the dedication, May 20–22, of the **Pulkovo Observatory** near Leningrad, U.S.S.R. For many years the two men have been active in the work of the International Astronomical Union.

During their 2-wk stay in Russia, Dr. Brouwer and Dr. Nassau were guests of A. N. Nesmeyanov, president of the Russian Academy of Sciences. The dedication was followed by 3 days of conferences on astrometry and the study of variable stars at which both scientists presented papers. The series of meetings, in which leading astronomers from a number of Western countries took part, is thought to be one of the most important and significant events to be sponsored by the Russians in recent years.

Sweden's first atomic reactor is nearing completion and will start operating this summer. The entire plant has been blasted down into granite to a depth of 120 ft, and its rock roof has a thickness of 40–50 ft. The safeguard against radiation contains 1500 tons of iron ore. Reflector walls containing 60 tons of graphite will surround the heavy-water tank. The reactor contains 3 tons of uranium and the aluminum tank holds 7 tons of heavy water, bought from Norway at a cost of $1,400,000. The plant is connected with the subterranean laboratory of the Academy of Engineering Sciences in Stockholm's Science City. Some 20 persons will be employed at the reactor proper. The semi-state-owned company AB Atomenergi has received grants of $6,400,000 for completing the installation.

On May 20 the New York Academy of Medicine, in collaboration with the Asia Institute Association, presented a program in honor of the 1000-yr anniversary of the birth of the great **Persian physician Avicenna.**

During May, Frank J. Mather, III, biologist at the Woods Hole Oceanographic Institution, initiated a **bluefin tuna tagging** project in an effort to learn more about migration routes. Working from the Lerner Marine Laboratory at Bimini in the Bahamas, Mr. Mather and cooperating fishermen hooked fish by the conventional method and then harpooned small stainless steel darts into them. Attached to the dart was a 10-in. plastic streamer marked with a number and the words, "Reward, W.H.O.I., Woods Hole, Mass., U.S."

Development of a new isotope material that may become an important factor in cancer research has been announced by Arthur F. Rupp, director of the Operations Division at Oak Ridge National Laboratory. For the first time large quantities of the radioisotope **cesium-137** have been separated and compressed into pellets, an achievement that is the result of 2½ yr of research.

The cesium-137, which is the most important long-lived gamma-ray emitting isotope found in spent reactor fuel, was chemically separated from fission products. The first two pellets will be used as a radiation source in a new teletherapy unit being prepared for cancer research in the Medical Division of the Oak Ridge Institute of Nuclear Studies. "Large quantities" of high purity cesium-137 means just two pellets, each about 1 in. in diameter and ½ in. thick, and weighing a little more than 1 oz. They contain 1540 curies of radioactivity, equivalent in radiation energy to more than 1 lb of radium, which at current rates would cost more than $1,000,000. Cesium-137 has great potentialities for applications where x-ray machines, radium, or radioactive cobalt-60 are now commonly used.

In a recent issue of the *Journal of the American Medical Association*, four Los Angeles physicians, Richard V. Freeman, Louis M. Berger, Sidney Cohen, and Wilbur A. Selle, report that more and more patients are being **saved from death** only to lead a helpless child existence the rest of their lives. The patients are those whose hearts stop beating and who are revived by the dramatic procedure of opening the chest and massaging the heart until it starts beating again. In such cases the brain has been deprived of oxygen for so long that it has been irreversibly and severely

damaged. In the Veterans Administration Neuropsychiatric Hospital in Los Angeles there are three such patients, ranging in age from 27 to 29 yr but with the mental capacities of, at most, a 7-yr-old.

The Atomic Energy Commission is now making available to the public on a limited basis the specialized **facilities of the Materials Testing Reactor** at the National Reactor Testing Station in Idaho. Charges for irradiation—based on all costs involved, including depreciation, overhead and operating expenses—are considered to be sufficiently low to bring the service within the means of qualified research organizations. Applications should be filed with the U.S. Atomic Energy Commission, Isotopes Division, Oak Ridge, Tenn. The Isotopes Division issues authorizations to persons or firms who are equipped to handle radioactivity in a safe manner. The contractor operating the MTR, namely, Phillips Petroleum Co., Idaho Falls, should be contacted directly for information concerning technical questions relating to irradiation services, scheduling, price lists, and arrangements for obtaining these services.

Scientists in the News

Isaac Costero, neuropathologist at the Cardiology Institute, Mexico City, is guest lecturer at the University of Texas Medical Branch during May and June. He is giving a series of seminars on the origin and function of fibroblasts, and is also conducting special experimentation in the Tissue Culture Laboratory.

Supported by a $15,000 grant from the Carnegie Foundation, **Leonard W. Doob,** professor of psychology at Yale University, is leaving this month to spend a year on the staff of the East African Institute of Social Research. He will participate in a project designed to gain an understanding of some of the problems of the people of Africa as they adjust to the extremely rapid social and economic changes occurring there.

James B. Fisk, director of research in physical sciences at Bell Telephone Laboratories, has been elected vice president in charge of research. He succeeds **Ralph Bown,** who continues as a vice president with a new assignment in charge of the long-range planning of laboratories programs.

Herbert Spencer Gasser, Nobel Prize winner and director of the Rockefeller Institute since 1935, has been awarded the Kober Medal for 1954 by the Kober Foundation at Georgetown University. The medal is given annually to a member of the Association of American Physicians who has contributed to the progress and achievement of the medical sciences or the medical profession.

At Montana State University the following faculty changes have been announced. On July 1, upon the retirement of **R. H. Jesse,** vice president of the University and chairman of the Chemistry Department, **A. S. Merrill,** at present dean of the faculty and professor of mathematics, will be elevated to the vice presidency, retaining his other titles as well. Effective Apr. 15, **Harold Chatland,** chairman of the Department of Mathematics, was appointed dean of the College of Arts and Sciences.

Alfredo Lanari, formerly head of the Experimental Laboratory of Pathology and Clinical Tuberculosis at the National Hospital of Clinics in Buenos Aires, and also associate professor of clinical medicine at the National University of Argentina, has been appointed chief of the Cardio-Pulmonary Laboratory of the National Jewish Hospital at Denver.

G. Stanley Meikle, research director of the Purdue Research Foundation, will become vice president of that foundation July 1. He will be succeeded as director of research by **Ralph A. Morgen,** who is at present program director for engineering at the National Science Foundation.

Tribute to his contributions to the fields of chemistry and education was paid to **Ralph E. Oesper,** retired University of Cincinnati professor, when he received the 5th annual Eminent Chemist Award of the American Chemical Society's Cincinnati section.

At an annual awards ceremony at the U.S. Department of Health, Education and Welfare, **Winfred Overholser, Irvin Kerlan,** and **Henry Welch** were honored.

Two faculty members at the University of Chicago School of Medicine have been honored by appointment to named professorships. **Walter Lincoln Palmer,** professor of medicine, has been made Richard T. Crane professor in medicine; and **William E. Adams,** professor of surgery, has been designated as the James Nelson and Anna Louise Raymond professor of surgery.

Wilhelm Reiss, who joined Bristol-Myers in 1953 as scientist-in-charge of analytical and physical chemistry, has been made director of research for Bristol-Myers Products Division.

The Society of Illinois Bacteriologists has named **James A. Reyniers** of the University of Notre Dame as the recipient of its Pasteur Award for 1954. Dr. Reyniers, who is founder and director of the University's Lobund Institute, was selected "for his pioneering work in germ-free research."

Sam H. Sanders, Jr., has been named head of the Department of Otology, Laryngology, and Rhinology at the University of Tennessee College of Medicine, succeeding **Charles Blassingame,** who asked to be relieved of his administrative duties. Dr. Blassingame will continue as professor in the department.

Two Gold Heart Awards, one for outstanding contributions to cardiovascular medicine and the other for

advancement of the heart program, have been presented by the American Heart Association to **Howard B. Sprague,** clinical associate in medicine at the Harvard University School of Medicine, and **S. DeWitt Clough,** managing director of the Chicago Heart Association.

The Distinguished Service Silver Medallion was awarded to **Robert L. King** of Seattle, retiring president who now becomes chairman of the Association's Scientific Council.

On July 1, **Eliot Stellar,** assistant professor of psychology at The Johns Hopkins University, will join the Institute of Neurological Sciences of the University of Pennsylvania as a member of the Institute and as associate professor of physiological psychology.

Charles E. Stearns, assistant professor of geology at Harvard University, will become dean of the Tufts College School of Liberal Arts, effective in September.

Otto Struve, professor of astronomy and chairman of the department at the University of California, Berkeley, has received the Rittenhouse Medal "for distinguished service in astronomy." The award was made at the Franklin Institute by the David Rittenhouse Astronomical Society.

The City College of New York has announced the appointment of **Laura Thompson** as professor in the Department of Sociology and Anthropology, effective in September. She is an authority in interdisciplinary social action research and applied anthropology, and has carried on field research in Fiji, Guam, Hawaii, and Iceland, and among the Hopi, Papago, Navaho, Sioux, and Zuni Indians. Dr. Thompson is known especially for her work as coordinator of the Indian Personality and Administration Research Project sponsored by the U.S. Office of Indian Affairs, the University of Chicago's Committee on Human Development, and the Society of Applied Anthropology.

She succeeds her husband, **John Collier,** who has reached the mandatory retirement age. Prof. Collier was U.S. Commissioner of Indian Affairs from 1933–1945; he joined the City College faculty in 1947. He plans to continue his vigorous opposition to the current U.S. policy of "assimilation" of the American Indian, which policy is a reversal of the "tribal" approach that he introduced 20 yr ago and that has been adopted by Canada, Mexico, Brazil, and other countries in the Western Hemisphere. Prof. Collier says that "So-called assimilation means the abrogation of all treaties with the Indian tribes and destruction of tribal self-government. It is unfair, ineffective and is vehemently opposed by the Indians themselves."

Edgar D. Tillyer, for many years director of research at American Optical Co., received the first of the medals bearing his name to be awarded by the Optical Society of America. The award was made in honor of his outstanding work in vision. Among Dr. Tillyer's contributions are methods for correcting oblique errors in ophthalmic lenses and the development of Tillyer lenses. He also developed the monocentric bifocal, the free-surface iseikonic, and the corrected deep-curve lenses. In addition Dr. Tillyer devised several rare-earth glasses with particular absorptive qualities, an additive trial lens series, and a number of diagnostic instruments.

Cornelius D. Van Houweling, for some years an official of the American Veterinary Medical Association, has become director, Livestock Regulatory Programs, of the U.S. Department of Agriculture.

At the National Chemical Exposition in October, **Ernest H. Volwiler,** president of Abbott Laboratories and chairman of the Board of Directors of the American Chemical Society, will receive the Chemical Industry Medal for 1954 "for conspicuous services to applied chemistry."

Harold A. Zahl, director of research at the Signal Corps Engineering Laboratories, Fort Monmouth, has received the Institute of Radio Engineers' Harry Diamond Memorial Award for 1954 "for his technical contributions, his long service, and his leadership in the U.S. Army Signal Corps research program."

Education

Baylor University has adopted a cooperative study plan with **Duke University** leading to a B.S. degree at Baylor and a Master of Forestry at Duke. Three years will be spent at Baylor and the final two years at Duke.

Duke University Marine Laboratory at Beaufort, N.C., has announced plans for a 6-wk radiation biology course to be given June 9–July 17. The work at Beaufort will be integrated with a more specialized 6-wk course in radiation biology to be given at the Mountain Lake Biological Station of the University of Virginia immediately following the Duke course.

A summer workshop on **"Integrative teaching in high school and college"** will take place July 19–23 at Wisconsin State College under the joint sponsorship of the College and The Foundation for integrated Education, Inc. Included on the list of speakers are: Henry Margenau, Higgins professor of physics and natural philosophy, Yale University; Vernon Bollman, professor of physics, Occidental College; James D. Hamilton, Department of Medical Research, University of Western Ontario; Ludwig von Bertalanffy, professor of biology, University of Ottawa; Ruth Lofgren, formerly assistant professor of bacteriology, University of Michigan, and now research associate, Foundation for Integrated Education; Morris I. Stein, Department of Psychology, University of Chicago.

Massachusetts Institute of Technology and Raytheon Manufacturing Co. have announced that the electronics firm is to become one of nine industrial organizations taking part in M.I.T.'s cooperative course in electrical engineering. Under this plan, engineering students of

the school are selected for practical experience in the laboratories and factories of the participating companies. Paralleling their academic pursuits with actual work in their chosen careers, these students upon graduation will be awarded B.S. and M.S. degrees simultaneously.

New York University has received a grant of $500,000 from the Murry and Leonie Guggenheim Foundation to establish the **Murry and Leonie Guggenheim Institute of Dental Research** as part of the University's College of Dentistry. The new unit will be housed in a 7-story building owned by the University at 339 E. 25 St.

Grants of $30,000 from the American Cancer Society and $15,000 from the National Cancer Institute of the U.S. Public Health Service have been made to the **National Committee for Careers in Medical Technology** for use in a program to recruit more young people into the profession of medical technology. The announcement of the awards was made by the newly formed Committee, which is sponsored by the American Society of Medical Technologists, the American Society of Clinical Pathologists, and the College of American Pathologists. Headquarters of the Committee are at 1785 Massachusetts Ave. NW, Washington, D.C.

Members of the NCCMT are: William O. Russell, chairman, representing the American Society of Clinical Pathologists; Ruth Hovde, incoming president of the American Society of Medical Technologists; and Joseph A. Cunningham, of the College of American Pathologists. Although nearly 20,000 medical technologists are registered with the Board of Registry, it is estimated that a total of 70,000 could be used in all phases of medical and scientific work in the United States.

A course in **"Newer developments in cardiovascular diseases"** will be given at the Mount Sinai Hospital, New York, Oct. 11–15, under the auspices of the American College of Physicians. Arthur M. Master and Charles K. Friedberg will direct the course. Prominent cardiologists and cardiac surgeons will participate.

A graduate course in **nuclear engineering**, designed for students who hold B.A. degrees in engineering and have completed differential equations, will be offered this fall in the evening division at Illinois Institute of Technology.

The Rutgers School of Education and the New Jersey Science Teachers Association are jointly sponsoring a 9-day **Science Institute**, beginning July 7, to familiarize the State's elementary and secondary school science teachers with the most up-to-date and effective teaching tools and methods in their fields.

A $210,000 grant from the Commonwealth Fund of New York will finance studies to explore possibilities of making far-reaching improvements in medical teaching at **Stanford School of Medicine** when it moves to the University's Palo Alto campus. Four Committees, totaling 69 members from the faculty, alumni, and trustees of the University, and from Bay Area communities, are already at work on preliminary studies. Another committee is considering plans for future use of the Medical School's buildings in San Francisco. Funds provided by the grant will pay for administrative expenses, and for travel of committeemen and consultants.

The U.S. Atomic Energy Commission has authorized construction of two heavy-particle accelerators—one at **Yale University**, the other at the **University of California Radiation Laboratory**—for research of interest to the AEC. Most particle accelerators constructed to date utilize relatively light particles, whereas the new ones will accelerate nuclei ranging from beryllium to neon.

The accelerator at UCRL will be used primarily in nuclear chemistry studies, such as the possible production and identification of new elements and of new isotopes of known elements. The machine at Yale will be used principally in studies of the physics of heavy-particle nuclear interactions. Both machines will be linear accelerators. They will impart energy of approximately 10 Mev to each nucleus, which is sufficient to allow the nuclei to interact with even the heaviest known elements. The AEC will contribute $1,200,000 for the construction of each accelerator.

The 12th annual session of the **Yale University Summer School of Alcohol Studies** will be held this year from July 5–29. It will be followed by an **Institute on Alcoholism** for registered professional nurses, July 29–31, which is being held for the first time.

Grants and Fellowships

The **Damon Runyon Memorial Fund** made cancer research grants to 8 institutions and 23 fellows during April.

Duke University. M. Hobbs. Properties of some smoke aerosols, $50,000.

Massachusetts General Hospital. R. M. and J. B. Graham, cancer immunity in patients, $13,600. E. B. Keil and P. C. Zamecrik, separation of microsome fractions and of soluble proteins involved in protein synthesis in normal rat livers and primary hepatomas, $2670. J. C. Aub and T. C. Hall, pilot project in three-dimensional tissue culture, $5132. R. W. Jeanloz and M. Soodak, chemistry and biochemistry of glycoproteins, $5190.

Massachusetts Institute of Technology. J. G. Trump. Physical and clinical studies with high-energy electrons, $20,000.

Worcester Foundation. G. Pincus. Steroid metabolism, especially in relation to cancer, $7400.

University of Florida. F. E. Ray. Study of gastric cancer: experimental carcinogenesis; metabolism of radioactive compounds, $10,000.

St. Peter's General Hospital, New Brunswick, N.J. S. B. Moolten. Viremias associated with Hodgkin's disease and lymphosarcoma.

Emory University. J. H. U. Brown. Metabolism of steroid hormones, $5400.

Sloan-Kettering Institute for Cancer Research, N.Y.C. C. P. Rhoads, E. Day, and W. F. Whitmore. Pathologic physiology of prostatic cancer, $13,390.

Fellowships

R. Daoust, Montreal Cancer Institute. Rate of synthesis

of desoxynucleotides in normal and neoplastic tissues, $5000.

G. de Lamirande, Montreal Cancer Institute. Intracellular distribution of purines and pyrimidines in rat liver cell during carcinogenesis, $5000.

E. Pillers, University of Cambridge. Mechanism of action of chemical radiosensitisers, $3000.

H. F. Fisher, Carlsburg Laboratories, Copenhagen. Intermediary metabolism of enzymes, $3600.

E. E. Deschner, Mt. Vernon Hospital, Middlesex, England. Effect of oxygen tension on the radiosensitivity of ascites tumor cells after *in vivo* and *in vitro* irradiation, $3600.

R. G. Desai, New England Center Hospital. White cell antibodies, $4200.

Z. D. Komninos, New England Center Hospital. Relationship of inmunohemolytic anemia to malignant leukosarcoma, $4800.

N. A. Haydar, Peter Bent Brigham Hospital. Adrenal steroid metabolism in malignant diseases, $4000.

J. Brown, New England Center Hospital. Hepatic inactivation and excretion of sex hormones, agents blocking this effect, and applications to treatment of cancer of sex glands, $4800.

V. S. Sankar, Massachusetts Institute of Technology. Studies on the biosynthesis of purines, $3000.

J. L. Berk, Peter Bent Brigham Hospital. Factors controlling growth in neoplastic and normal tissue, $4200.

R. Kimmelstiel, Harvard Medical School. Utilization of labeled carbon-14 amino acids by human placenta *in vitro*, $3600.

M. D. Richards, Stanford University. Hemorrhagic complications of leukemia, $5000.

E. G. Daskalakis, University of California School of Medicine. Biosynthesis of carcinogenic compounds, $4800.

F. Dituri, University of Pennsylvania School of Medicine. Studies on lipid synthesis by particle free extracts of liver, $4800.

J. M. Weiss, Washington University School of Medicine. The ergastoplasm, $4800.

E. Borysko, Johns Hopkins University School of Hygiene. Comparative electron microscopic study of normal and malignant cells, $4200.

W. A. Sherrer, Medical College of Georgia. Synthesis of some phosphorus fractions in the particulate matter of normal and hepatoma-bearing rats, $3950.

L. G. Ortega, Sloan-Kettering Institute. Study of the human cancer cell by newer methods of microscopy, $5400.

Min Chiu Li, Sloan-Kettering Institute. Effects of hypophysectomy and hypothalamic irradiation on the growth of mammary cancer, $5600.

S. Fink, Montefiore Hospital. Gastro-intestinal function studies in neoplastic and other wasting diseases, $3000.

G. M. Mateyko, N.Y. University. Histochemical and cytochemical studies on isolated normal and neoplastic cells subsequent to intracellular stratification, $4800.

Mei Lin, Rockefeller Institute for Medical Research. Chemistry and physiology of the nucleus, $3600.

The **Eugene Higgins Trust** for scientific education and research has made grants of $275,000 each to Columbia, Princeton, Harvard, and Yale. Grants to these universities are given annually under the will of Mr. Higgins, New York philanthropist who died in 1948. The value of the trust is now about $34,000,000. This year's allotments are $100,000 greater than those made in past years.

The second group of awards under the **Foreign Research Scientists Program** of the National Academy of Sciences—National Research Council has been made.

From Greece

G. Catravas, University of Chicago, with H. S. Anker. Organic chemistry.

D. Galanos, University of Illinois, with H. E. Carter. Food chemistry.

A. Granitsas, Columbia University, with E. T. Engle. Physiology.

T. Yannakopoulos, National Bureau of Standards, with A. Brenner. Physical chemistry.

C. Zerlentis, Oklahoma A. & M. College, with J. R. Harlan. Plant geography and ecology.

From the Netherlands

D. de Zeeuw, Purdue University, with A. C. Leopold. Horticulture.

J. P. Murre, University of Chicago, with A. Weil. Mathematics.

From Norway

A. Jensen, Yale University, with W. Bergmann. Organic chemistry.

H. Olsen, Cornell University, with H. A. Bethe. Physics.

The fellowship awards announced below are all under the administration of the **National Academy of Sciences—National Research Council.**

Postdoctoral Fellowships in the Natural Sciences, Rockefeller Foundation

R. C. Blanchfield, Princeton University. Knot theory in 3-manifolds, Massachusetts Institute of Technology.

C. W. Curtis, University of Wisconsin. Ideal theory in noncommutative rings and the theory of representations of algebraic systems, Institute for Advanced Study.

T. Delevoryas, University of Illinois. Morphology of plant fossils, University of Michigan.

F. S. Ham, Harvard University. Energy bands of alkali metals, and theoretical problems in the area of ionic crystals and semiconductors, University of Illinois.

J. B. Hendrickson, Harvard University. Elucidation of the structures of cucumin and leptodermin, University of London.

N. E. Phillips, University of Chicago. Heat capacities of some superconductors with low transition temperatures, University of California.

Postdoctoral Fellowships in the Medical Sciences, Rockefeller Foundation

J. Barrow. Relationship between the water content of bacteria and their capsules and the rate at which they are captured by phagocytic cells of the blood and reticulo-endothelial system, Washington University School of Medicine.

S. B. Gertner. Release of chemical transmitters during nerve stimulation, and mechanisms concerned in the failure of transmission during prolonged stimulation, National Institute for Medical Research, London.

J. H. Luft. Morphology and histochemistry of the electric organ of the eel in comparison with striated muscle, Harvard Medical School.

S. Postel. Detection, isolation, and physiology of thyroid stimulating hormone in body fluids, Massachusetts General Hospital.

J. G. Wegener. Some integrative functions of the cerebral cortex, Institute of Living, Hartford, Conn.

Lilly Research Laboratories Postdoctral Fellowships in the Natural Sciences

S. G. Bradley, Northwestern University. Genetic studies with the actinomycetes, University of Wisconsin.

T. C. Bruice, University of Southern California. Model peptidases, University of California.

D. T. Gish, Cornell University. Synthesis of beef vasopressin, Medical College of Cornell University.

Lilly Research Laboratories Postdoctoral Fellowships in the Medical Sciences

D. J. Buchanan. Enzymatic degradation of blood-group-specific substances, Lister Institute of Preventive Medicine, London.

G. M. Conzelman, Jr. Fractions of certain 8-aminoquinolines which have harmful effects on the blood, Christ Hospital Institute of Medical Research, Cincinnati, Ohio.

D. G. Cornwell. Plasma lipoproteins, Harvard University.

J. C. Shipp. Functions of the kidney tubule, Harvard Medical School.

Merck Senior Postdoctoral Fellowships in the Natural Sciences

E. W. Fager, Oxford University. Quantitative studies of the succession of animal communities in logs, Oxford University.

F. Moog, Washington University. Influence of adrenocortical hormones on juvenile development of the mouse, Molteno Institute, Cambridge, England.

C. M. Stevens, State College of Washington. Nucleic acid metabolism in neurospora, California Institute of Technology.

RCA Predoctoral Fellowships in Electronics

J. R. Johnson, University of Pennsylvania. Determination of optical constants of semiconductors by reflection.

J. N. Pike, University of Rochester. Photoconductivity of cadmium sulfide at low temperatures.

R. E. Steele, Stanford University. Biological effectiveness of high-energy electrons and x-rays produced by a 6-mev linear electron accelerator.

R. K. Whitford, Purdue University. Synthesis techniques for optimum filtering in sampled data systems containing nonlinearities.

Eleven grants totaling approximately $30,000 have been made by the **Research Corporation,** New York, to inaugurate a new West German grants program. The program, which supports fundamental research in physics, chemistry, and nutrition, will be financed from royalties collected in Germany on American patents for the manufacture of vitamin B_1. Royalties earned in the postwar period added to those to be collected during the remaining life of the patents are expected to be sufficient for a 5- to 10-yr program of the present scope. This is the first time, it is believed, that funds earned in a foreign nation have been used by an American foundation for continuing research support in the country of origin.

University of Göttingen. P. ten Bruggencate. Deviations from the thermic balance in the outer layer of the sun.

University of Heidelberg. F. Eichholtz. Behavior of the inorganic phosphates in the body, their reactions with energy-rich phosphates, and the influence on these reactions.

Max Planck Institute, Göttingen. M. Eigen. Velocity and mechanism of high-speed ionic reactions.

University of Hamburg. J. Kühnau. Physiology of the B_{12} vitamins and of animal protein factors.

University of Munich. F. Lynen. Biosynthesis of the fatty acids and isoprene derivatives.

Luise Hospital, Aachen. H. Schröder. Effects of modern antibiotics on vitamin metabolism.

University of Frankfurt. J. Stauff. Structure of proteins and nucleic acids.

Brunswick School of Technology. U. Stille. Luminous phenomena in active nitrogen.

University of Freiburg. K. Wallenfels. Production of pure enzymes and the mechanism of enzyme action.

University of Tübingen. F. Weygand. Peptid syntheses by way of trifluoracetyl-amino-acids.

University of Frankfurt. T. Wieland. Synthesis of peptides, related to tuber-leaf fungi poisons.

Research proposals directed to the Division of Biological and Medical Sciences of the National Science Foundation will be received at any time. Proposals on projects to begin the second half of the academic year 1954–55 should be received by the Foundation *before Sept. 15.*

Award of the **Russell M. Wilder Fellowship** to Willard Arthur Krehl, associate professor of nutrition at the Yale University School of Medicine, has been announced by the National Vitamin Foundation, Inc., the organization making the award. Dr. Krehl is the first recipient of the $15,000, 3-yr fellowship, which was established in 1953 to encourage outstanding persons holding doctoral degrees to further their studies in nutrition and related subjects. The fellowship will enable Dr. Krehl to work for the M.D. degree while continuing to participate in nutrition and metabolism studies.

A 48-percent increase in expenditures for fundamental research and fellowship programs for 1954–55 has been announced by the **Shell Fellowship Committee** on behalf of Shell Chemical Corp., Shell Development Co., Shell Oil Co., and Shell Pipe Line Corp. The increase will raise expenditures next year to $263,500 from the current year's $177,500.

Research awards are made to university departments to aid them in expanding research in their particular fields. A new feature of the grants for 1954–55 is that each $5000 grant designated for a specific science department will be supplemented by an unrestricted grant of $2500 to be used by the institution as it sees fit.

The number of fundamental research grants will increase from 14 to 19, and there will be 49 graduate fellowships, one more than last year. Fellows are selected by their respective institutions. Those receiving grants are California Institute of Technology, Carnegie, Cornell, University of Chicago, Harvard, Massachusetts Institute of Technology, Northwestern, Notre Dame, Princeton, Rice Institute, University of Rochester, St. Louis University, Stanford, and Yale. The grants are in the fields of chemistry, chemical engineering, geology, geophysical engineering, mechanical engineering, metallurgy-corrosion, physics, and engineering mechanics. Shell places no restrictions on the publication of research results or on the way the funds are spent.

The **Upjohn Company** has announced these research grants for 1954–55.

Columbia University. D. M. Shapiro, College of Physicians and Surgeons. Cancer research, $5000.

Purdue University. H. C. Brown, Dept. of Chemistry. Effects of structure on chemical reactivity, $5000.

Tuskegee Institute. L. F. Cason, Dept. of Chemistry. Synthesis of drugs, $3000.

University of Wisconsin Depts. of Biochemistry and Bacteriology. Factors affecting the production of penicillin and other antibiotics, $3600.

The **Yale University School of Medicine** has announced the following appointments of fellows and departments in which they will study.

James Hudson Brown research fellows

P. B. Hagen, Oxford University. Dept. of Pharmacology.

J. F. Patino, Grace-New Haven Community Hospital. Dept. of Pathology and Surgery.

M. P. Stack-Dunne, University of Cambridge. Dept. of Physiology.

R. L. Vande Wiele, University of Louvain. Dept. of Obstetrics and Gynecology.

Alexander Brown Coxe research fellows

R. B. Barlow, University of Glasgow. Dept. of Pharmacology.

B. K. Kusserow, Yale University. Dept. of Pathology.

Meetings and Elections

The **American Academy of Dental Medicine** has elected these officers: pres., Alvin H. Berman; pres.-elect, George F. Clarke; v. pres., S. Leonard Rosenthal; sec., William M. Greenhut; treas., George G. Stewart.

The 35th annual meeting of the **American Geophysical Union** was held May 3–5 in Washington, D.C. While 874 registered, there were probably more than

1000 in attendance. All eight sections of the Union held both business and scientific sessions. The program included papers, reports, a symposium, several panel discussions, and a session of documentary films on oceanography. The papers alone numbered over 120; many of them will be published in the *Transactions*.

A highlight was the evening session at which the William Bowie Medal was awarded to Richard Montgomery Field, president of the Union from 1938 to 1941. His ability to point out significant geophysical problems, and to persuade people to work on them, resulted in an important era for the American Geophysical Union in the late 30's and early 40's. On this same evening a lecture was given by William C. Krumbein of Northwestern University on "Applications of statistics in the earth sciences." Joseph Kaplan of the University of California, chairman of the U.S. National Committee for the International Geophysical Year, 1957–58, outlined briefly the plans and program for the Geophysical Year and asked for the active support of the Union. Throughout the meetings there was extensive discussion regarding the 10th General Assembly of the International Union of Geodesy and Geophysics and the International Geophysical Year.

At the General Assembly there was a symposium on geophysical models, and five papers were presented on various aspects of such work. This was followed by a brief business meeting at which eight resolutions were approved and the general secretary reported that the total membership of the Union is now 5040. The dates for the 39th annual meeting are May 2–4, 1955.

The 31st annual convention of the **American Institute of Chemists** was held May 12–14 in Asbury Park, N.J. This convention is always unique in that all papers and discussions are centered around the personal problems of the chemist rather than around the science of chemistry. The New Jersey Chapter was host to the meeting, with David W. Young of Westfield as chairman.

The conference was climaxed by presentation of the A.I.C. Gold Medal Award to William J. Sparks, director of the Chemical Division of the Standard Oil Development Co. and chairman of the Division of Chemistry and Chemical Technology of the National Research Council. He was cited "as an eminent chemist who has striven unceasingly for the promotion of chemistry and for . . . the professional advancement of the chemist."

In addition, Vera F. Kimball was honored for 25 yr of service with the national office of the Institute in New York and for 20 yr as editor of *The Chemist*. She was presented with a framed life membership and also with an engraved silver tray from the Council of the Institute.

Officers of the **American Society of Safety Engineers** are: pres., W. F. Brown, Consolidated Edison Co., New York; 1st v. pres., W. N. Cox, Jr., Georgia Institute of Technology, Atlanta; 2nd v. pres., E. B. Landry, U.S. Post Office Dept., Washington, D.C.; sec., J. B. Johnson, ASSE, 425 N. Michigan Ave., Chicago 11, Ill.; treas., G. F. Nuerenberger, A. B. Dick Co., Chicago.

Rudolf T. Kempton, professor of zoology at Vassar College, has been appointed secretary of the **American Society of Zoologists** to complete the term of S. Meryl Rose who has resigned.

Officers for 1954 of the **Biometric Society, Eastern North American Region,** are: v. pres., S. Lee Crump; sec.-treas., A. M. Dutton. The Regional Committee consists of D. B. Duncan, H. C. Batson, H. W. Norton, T. A. Bancroft, W. T. Federer, and A. B. Chapman.

The **General Assembly of the International Union of Theoretical and Applied Mechanics** will meet in Brussels, Belgium, on July 27–28. This meeting, open only to members of the General Assembly, will consider plans for future symposia and will discuss other means of promoting international effort in theoretical and applied mechanics, such as more national or regional meetings in addition to the periodic international congress. The 9th international congress will be held in Brussels in 1956. The second U.S. congress will be held at the University of Michigan, June 14–18.

The U.S. members of the General Assembly are Hugh L. Dryden (president of IUTAM), N. J. Hoff, J. C. Hunsaker, A. T. Ippen, Th. von Kàrmàn, M. H. Martin, R. D. Mindlin, N. M. Newmark, and S. Timoshenko.

On July 29–31, following the General Assembly meeting, some 27 selected leaders in photoelasticity and photoplasticity from ten countries will meet in a colloquium arranged by IUTAM with the aid of a grant from UNESCO to the International Council of Scientific Unions. The organizing committee consisted of H. Le Boiteux, France, chairman; H. Favre, Switzerland; and M. Hetenyi, United States.

Small colloquia of invited specialists have proved an efficient means of obtaining timely reviews. Publication of the proceedings carries the results to all workers in the field. The U.S. participants in the **Colloquium on Photoelasticity and Photoplasticity** include D. C. Drucker, A. J. Durelli, M. M. Frocht, M. Hetenyi, R. D. Mindlin, W. M. Murray, and E. Orowan.

Officers for 1954 of the **Indiana Academy of Science** are: pres., O. B. Christy, Muncie; v. pres., Raymond Girton, Purdue University; sec., W. A. Daily, Eli Lilly & Co.; treas., F. J. Welcher, Indiana University. The representative to the AAAS Council is Sears Crowell of Indiana University.

At the Symposium on Molecular Structure and Spectroscopy that took place in Columbus last June, a committee was appointed to consider matters of common interest to **infrared spectroscopists.** This committee has met in Columbus and Pittsburgh, and has continued discussions by mail. It is believed that the results of some of the discussions will interest those attending the symposium this year, and therefore a

meeting is scheduled for the evening of June 17, at Ohio State University. Interested persons are urged to be present.

One of the topics to be considered is the need for an infrared society. A mimeographed report prepared by the committee may be obtained from Dr. Van Zandt Williams, Perkin-Elmer Corp., Norwalk, Conn.

The chemistry of television screen manufacture, the role of chemical adsorption in photography, and studies of the detailed structure of reclaimed rubber will be three of the topics reported in scientific sessions of the **28th National Colloid Symposium,** to be sponsored by the American Chemical Society's Division of Colloid Chemistry on June 24 at the Rensselaer Polytechnic Institute. The effect of atom-smashing treatment on blood plasma extenders, chemical agents that thicken lubricating oil, and studies of the physical nature of asbestos fibers will also be discussed in the 30 technical papers to be presented. W. O. Milligan of Rice Institute, an authority on chemical catalysts and the theory of colloids, will be general chairman.

The 63rd annual meeting of the **Ohio Academy of Science** was held at Ohio University, Apr. 15–17. There were sectional programs and displays of exhibits for the Annual Science Day of the Junior Academy. The presidential address was delivered by R. A. Hefner of Miami University on "Selective factors in human survival."

Officers for 1954–55 are: pres., Rush Elliott, Ohio University; sec., R. W. Dexter, Kent State University; treas., R. M. Geist, Capital University. The next annual meeting will be held at Ohio Wesleyan University, Apr. 21–23, 1955.

Officers of the **Southern Psychiatric Association** are: pres., John D. Trawick; pres.-elect, Joseph E. Barrett; sec.-treas., Joseph L. Knapp. Vice presidents are Titus Harris and Frank Donaldson.

Miscellaneous

The **179th Anniversary of the Corps of Engineers, U.S. Army,** will be celebrated at a formal dinner to be held at Fort Belvoir, Va., June 19. A cordial invitation is extended to all present and former Corps officers.

A **bibliography on the relations of literature and science,** "M L A General Topics VII: Relations of Literature and Science. Report of the Bibliography Committee, 1953," will be available after June 15 from Kester Svendsen, Dept. of English, University of Oklahoma, Norman.

Notice is hereby given that on Nov. 11 the **International Commission on Zoological Nomenclature** will start to vote on the following cases involving the possible use of its plenary powers for the purposes specified against each entry (full particulars of these cases were published on May 11 in the *Bulletin of Zoological Nomenclature,* parts 6, 7, and 8, vol. 9): (1) *immigrans* Sturtevant, 1921 (*Drosophila*) (Cl. Insecta, Order Diptera), validation of; (2) *pruni* Geoffroy, 1762 (*Aphis*) (Cl. Insecta, Order Hemiptera), validation of; (3) *Lachnus* Burmeister, 1835, and *Cinara* Westwood, 1835 (Cl. Insecta, Order Hemiptera), designation of type species for; (4) *Stentor* Oken, 1815 (Cl. Ciliophora), validation of, and designation of type species for; (5) *Melanargia* Meigen, 1828 (Cl. Insecta, Order Lepidoptera), validation of; (6) Geoffroy, 1762, *Hist. abrégée,* validation of six generic names (*Stratiomys, Stomoxys, Volucella, Nemotelus, Scatopse, Bibio*) in the Order Diptera, published in; (7) *Palmatotriton* Smith, 1945 (Cl. Amphibia), suppression of; (8) *Ammonites mammillatus* Schlotheim, 1813, designation of neotype for; and *Douvilleiceras* de Grossouvre, 1893, designation of type species for (Cl. Cephalopoda, Order Ammonoidea).

Comments on these cases should be sent promptly to Francis Hemming, Secretary to the Commission, 28 Park Village East, Regents Park, London, N.W.1.

The **National Society for Crippled Children and Adults,** Chicago, has announced that 20 percent of the skilled professional positions in the 874 facilities of the Easter Seal Society are vacant. There are some 200 vacancies among the 800 positions for program directors, physical therapists, occupational therapists, speech therapists, special education teachers, medical social workers, and psychologists. Still other jobs are available in the administrative force. It is estimated that, within the next 5 yr, 7200 occupational therapists must be added to the present 3600 in that field; that 5000 physical therapists must be added to the present 5000; and that 8000 medical social workers must augment the present force of 6000.

The Army Chemical Center, Md., has **openings for chemists,** GS-9 through GS-15, with salaries ranging from $5060 to $10,800 per year. Application information may be obtained from any U.S. Post Office.

Announcement has been made that the monthly journal, ***Proceedings of the National Academy of Sciences,*** is to be published by the University of Chicago Press. Official organ of the National Research Council as well as the NAS, the *Proceedings* is edited by a board of 17 members of the Academy. Linus Pauling is chairman of the board, and Edwin B. Wilson is managing editor.

The **Western Society of Periodontology** has a new quarterly publication, the third issue of which is now in preparation. The object of the publication is to abstract all periodontal literature written in the English language. Certain French, German, and Spanish articles will also be abstracted as they become available. The journal is self-supporting, and the editorial staff and secretarial work is done gratis in the hope of promoting better periodontal understanding. The editor is Max Shapiro, 202 S. Hamilton Dr., Beverly Hills, Calif.

Book Reviews

Southern African Mammals, 1758 to 1951: A Reclassification. J. R. Ellerman, T. C. S. Morrison Scott, and R. W. Hayman. British Museum (Natural History), London, 1953. 363 pp., maps. £2.

There has never been much agreement between British and South African authors on problems of South African mammalian taxonomy. Consequently, it is not surprising that a British Museum *Southern African Mammals* should follow by only 2 years the publication of Austin Roberts' handsome volume on the *Mammals of South Africa.*

Roberts had a local point of view, and his taxonomy suffered a fate common to that of many workers in geographically isolated museums. He had a wonderful South African collection but very little material from neighboring regions outside the Union. Under the circumstances, Roberts did remarkably well.

The *Southern African Mammals* of Ellerman, Morrison-Scott, and Hayman is a startling contrast. The attitude of these authors is cosmopolitan. They compare South African mammals with those of India, Europe, South America, and other parts of the globe. The results are revolutionary. Many South African species, in their opinion, have geographic ranges encompassing most of the Palaearctic region. Some, they believe, have their nearest relatives in the Andes Mountains of South America.

The concepts of taxonomy of the authors of *Southern African Mammals* are rather more liberal than are those of most American mammalian taxonomists. They believe that formal nomenclature recognition of subspecies should be abandoned, and they refer to the opinion of Morrison-Scott (*A List of British Mammals,* 1952) that "The species is the natural unit and the thing which really matters." However, subspecies are not abandoned in *Southern African Mammals* and are, as a matter of fact, treated rather conservatively: "whereas it is open to anyone validly (nomenclaturally) to describe a new race in a few hastily written lines, it is quite a different matter to collect together enough evidence conclusively to show that such a description should not have been made" (p. 2).

In view of these stated beliefs regarding the relative value and importance of species and subspecies, it is surprising to find all subspecies carefully listed and only a few synonymized, whereas two or more apparently valid species are frequently thrown together under a single name. The "species" of these authors is often equal to the "species group" of American taxonomists. These inconsistencies probably arise from a failure to admit that all faunas are not equally susceptible to reclassification at this moment. Some, such as the fauna of southern Africa, must wait upon the collection of more extensive study material.

However much disagreement their classification may arouse, it is to the credit of these authors that they have, in most instances, discussed the reasons for the changes they have set forth, so that other workers may have a basis for evaluating their conclusions.

In format, *Southern African Mammals* follows the convenient pattern set by the *Checklist of Palaearctic and Indian Mammals* of Ellerman and Morrison-Scott. It provides statements of geographic distribution, synonymies, citations to important references, taxonomic notes, and a full complement of well-constructed keys. Many important southern African collecting stations are shown on the maps.

CHARLES O. HANDLEY, JR.

U.S. National Museum
Washington 25, D.C.

A Practical Manual of Medical and Biological Staining Techniques. Edward Gurr. Interscience, New York, 1953. xix + 320 pp. $4.

This excellent and very useful manual of staining techniques is exactly what the author says it is in his preface: a practical manual "entirely divorced from theory and general statements." It is beautifully bound and clearly printed in easily readable type face, on fine-grade paper. The format shows thoughtful planing on the part of the publishers so that the book is designed as a laboratory companion. It is a quick and reliable reference for those not acquainted with the laborious details of theory who wish to investigate the state of some particular element, such as the cellular proteins or mitochondria.

The author is to be congratulated for his skill in accurately stating complex procedures in concise form. The book reveals his careful knowledge of the original literature. The first section deals with fixative fluids and other matters. From this, the student could determine, for example, in general the kind of reliable information he can expect to secure from tissues that may already be fixed in a particular fluid, such as Regaud's fluid for mitochondria. These fixatives are listed in alphabetical order. On the other hand, the excellent index would quickly tell the methods that reveal mitochondria. (I note that the author recommends a procedure for Regaud's method that differs with Regaud's original article of 1910.)

Section 2 deals with normal and pathologic histology of animals and gives a valuable clear-cut account of staining procedures, which are listed alphabetically along with the kind of element to be demonstrated. This list is conveniently set in boldface type. This book gives the best description of the G-Nadi reaction for oxidase granules I have yet found. The author is the only one who gives the important fact that the dimethyl-*p*-phenylenediamine should be purchased in sealed ampoules.

It is unfortunate that Gurr does not list Brachet's (1942) use of Pappenheim's stain to show ribonucleic acid as red particles and desoxyribosenucleic acid as

blue in the same cell. He tells in brief form the exact method of handling silver impregnation *in the dark,* a crucial point of DaFano's technique that nobody ever seems to tell except DaFano.

Sections of fluorescence microscopy and smear preparations are excellent. There is a valuable appendix, giving formulas of fixatives and stains, refractive indices of various agents, saturation solutions of reagents, and solubility of dyes. The index is very good.

The table of contents serves as a kind of index that is cross-referenced with the final index. This book ought to gain wide popularity with investigators, technicians, and students. Many new procedures are described and old ones are refreshed. The author should try his expert hand at simplifying the use of phase contrast microscopy and microincineration in future editions.

ROSS C. MACCARDLE

Laboratory of Pathology, National Cancer Institute Bethesda, Maryland

Chemical Physiology of Contraction in Body and Heart Muscle. A. Szent-Györgyi. Academic Press, New York, 1953. 135 pp. Illus. $4.80.

For the nonspecialist, this book contains both a very readable and a very personal account of recent researches into the mechanisms of muscle contraction. In many ways Szent-Györgyi's book serves as an object lesson in what is to be expected, as present-day experimental biology continues its advances. The way the muscle proteins actin and myosin interact continues to become a more and more complex subject. At the same time, the membrane emerges as a more and more concrete entity, and a good part of this short book is devoted to the description of effects that must be ascribed to membranes. The problems of muscle physiology thus appear to be divided into: a physicochemical study of muscle proteins, the membrane, and the nature of the conection between membrane processes and contraction. The author has something to say about all these problems, and while many of the suggestions advanced are quite speculative, others are certainly the best that can be done in the way of interpretation at present.

L. J. MULLINS

Purdue University, Lafayette, Indiana

Sample Survey Methods and Theory, Vols. I and II. Morris H. Hansen, William N. Hurwitz, and William G. Madow. Wiley, New York; Chapman & Hall, London, 1953. Vol. I, 638 pp., $8. Vol. II, 332 pp., $7.

The appearance of the two volumes on *Sample Survey Methods and Theory* fulfills a long-felt need in the field of sampling theory and application.

The authors have spent more than a decade in the development of sampling theory and its application to actual survey problems. The scope of the surveys conducted under their direction has probably been the most comprehensive ever conducted by any government or private organization. As a consequence, these books are not merely a restatement of theory and methods already published but are comprehensive discussions of real survey problems, alternative methods of solution, and the fundamental thinking processes that lead to new designs. The separation of the work into two volumes, *Methods and Applications* and *Theory,* enables the reader who is not concerned with development of theory to use the first volume. Anyone concerned primarily with theory and its development can concentrate on the second volume.

One of the principal features of these volumes is the method of presentation. Problems are presented in the same manner in which they evolved for the authors, available data are examined, and the questions asked are "How do we proceed to design a sample survey which can be conducted at minimum cost for a given error?" or "How do we plan a survey that can be designed for a given cost with a minimum error?" The various possible solutions are discussed and the most appropriate one is indicated.

In addition, the practitioner is given numerous rules of thumb which can be used in making a number of decisions in the design of sample surveys. These two volumes will probably be classics in the field of sampling for many years to come and are a must for any person who is involved in the conduct or analysis of any survey.

SAMUEL WEISS

Bureau of Labor Statistics, U.S. Department of Labor Washington 25, D.C.

Elements of Statistics. H. C. Fryer. Wiley, New York; Chapman & Hall, London, 1954. viii + 262 pp. Illus. $4.75.

This little book is well bound and printed on good paper. It reflects the author's training and his years of experience in teaching and consultation at Kansas Experiment Station. It has benefited by passing through processed versions before going into print. It is not a book planned for experimenters in need of help in design and analysis but rather a textbook for students in probability, elementary statistical methods, and sampling. The preface states that college algebra is a prerequisite for courses based on the text.

A brief chapter on the history of the subject is followed by a chapter on summarizing data, central tendencies and dispersion, which includes calculation of the standard deviation. Chapters follow on elementary probability and on binomial and normal distributions. The uses of confidence limits and chi-square tests are shown as well as the ideas of alternate hypotheses and quality control. These ideas are further developed in the next chapter on sampling normal populations, which includes a brief discussion of central limit theorem and non-normal data. The concluding chapter is on linear regression and correlation, including rank correlation. A number of numerical

(squares, logs, and so forth) and statistical tables complete the book; they include tables of G for testing hypotheses quickly and approximately by using the range. A four-page index is provided; references follow each chapter except the first. Illustrative numerical problems from subject-matter fields occur throughout, and exercises suitable for classwork, many with answers, are very numerous.

The book is clearly written and readable, and discussion is kept close to numerical illustrations and to data from such fields as psychology, genetics, tests of materials, crops, biology, and economics. It does not give discussions of procedure needed in various experimental situations nor does it catalog statistical methods in the classic order. No discussion of analysis of variance or of experimental design is found. The book should be an excellent preparation for courses either in more deeply mathematical statistics or in experimental statistics. For these uses, it seems very sound.

F. M. WADLEY

Arlington, Virginia

Books Reviewed in THE SCIENTIFIC MONTHLY

April

Age and Achievement, Harvey C. Lehman (Princeton Univ. Press). Reviewed by Stanford C. Ericksen.

The Making of a Scientist, Anne Rol (Dodd, Mead). Reviewed by W. J. Brogden.

The Logic of Modern Science, J. R. Kantor (Principia Press). Reviewed by Paul R. Farnsworth.

Steps in Psychotherapy, John Dollard, Frank Auld, Jr. and Alice Marsden White; Dael Wolfle, Ed. (Macmillan). Reviewed by Raymond W. Waggoner.

Films in Psychiatry, Psychology and Mental Health, Adolf Nichtenhauser, Marie Coleman, and David Ruhe (Health Education Council). Reviewed by Edith M. Lindsay.

Introduction to Electric Theory, R. G. Fowler (Addison-Wesley). Reviewed by William V. Smith.

J. Robert Oppenheimer and the Atomic Story, J. Alvin Kugelmass (Julian Messner). Reviewed by W. Paul Gilbert.

Puritan Sage: Collected Writings of Jonathan Edwards, Vergilius Ferm, Ed. (Library Pub.). Reviewed by Clarence L. Ver Steeg.

Conquest of the Moon, Wernher von Braun, Fred L. Whipple, and Willy Ley (Viking Press). Reviewed by Charles H. Smiley.

Living with a Disability, Howard A. Rusk and Eugene J. Taylor (Blakiston). Reviewed by Oscar O. Selke, Jr.

Disease and Its Conquest, G. T. Hollis (Oxford Univ. Press). Reviewed by Gaylord W. Anderson.

Managing Your Coronary, William A. Brams (J. B. Lippincott). Reviewed by Emmet B. Bay.

Elements of Chordate Anatomy, Charles K. Weichert (McGraw-Hill). Reviewed by D. H. Barron.

Cardano, the Gambling Scholar, Oystein Ore (Princeton Univ. Press). Reviewed by Samuel Karlin.

Contributions to the Theory of Games, Vol. II, H. Kuhn and A. W. Tucker, Eds. (Princeton Univ. Press). Reviewed by Samuel Karlin.

May

Atomic Weapons in Land Combat, G. C. Reinhardt and W. R. Kintner (Military Service Pub.). Reviewed by L. H. Rumbaugh.

Atoms and Energy, H. S. W. Massey (Elek Books; British Book Centre). Reviewed by Arthur H. Snell.

Relativity and Reality, E. G. Barter (Philosophical Library). Reviewed by M. E. Shanks.

Statistical Methods in Experimentation: An Introduction, Oliver L. Lacey (Macmillan). Reviewed by Joseph Berkson.

The Scientific Adventure, Essays in the History and Philosophy of Science, Herbert Dingle (Philosophical Library). Reviewed by Waldo H. Furgason.

An Introduction to Relaxation Methods, F. S. Shaw (Dover). Reviewed by Carl H. Walther.

General Biochemistry, William H. Peterson and F. M. Strong (Prentice-Hall). Reviewed by Harry G. Day.

Scientific Explanation, R. B. Braithwaite (Cambridge Univ. Press. Reviewed by B. Clifford Hendricks.

Practical Taxidermy, A Working Guide, John W. Moyer (Ronald Press). Reviewed by Charles S. East.

A Herd of Mule Deer, Jean M. Linsdale and P. Quentin Tomich (Univ. of Calif. Press). Reviewed by David H. Johnson.

How Animals Move, James Gray (Cambridge Univ. Press). Reviewed by William L. Straus, Jr.

Plant Diseases in Orchard, Nursery and Garden Crops, Ernst Gram and Anna Weber; R. W. G. Dennis, Ed. (Philosophical Library). Reviewed by Thomas H. King.

Motivation and Morale in Industry, Morris C. Viteles (Norton). Reviewed by Kimball Young.

The Recovery of Belief, C. E. M. Joad (Faber and Faber; Macmillan). Reviewed by Theodore M. Greene.

The Suez Canal in World Affairs, Hugh J. Schonfield (Philosophical Library). Reviewed by George Lenczowski.

The Primitive City of Timbuctoo, Horace Miner (Princeton Univ. Press). Reviewed by William Bascom.

The Way of the World, The Rushton Lectures for 1952, George H. T. Kimble (George Grady Press). Reviewed by Meredith F. Burrill.

Clay Mineralogy, Ralph E. Grim (McGraw-Hill). Reviewed by Margaret D. Foster.

Conversation with the Earth, Hans Cloos (Alfred A. Knopf). Reviewed by George T. Faust.

Machines That Built America, Roger Burlingame (Harcourt, Brace). Reviewed by Clyde E. Dankert.

June

Oil in the Soviet Union, Heinrich Hassman (Princeton Univ. Press). Reviewed by L. L. Sloss.

A Field Guide to Rocks and Minerals, Frederick H. Pough (Houghton Mifflin). Reviewed by Victor T. Allen.

Climatic Change, Harlow Shapley (Harvard Univ. Press). Reviewed by Herbert B. Nichols.

From Fish to Philosopher, Homer W. Smith (Little, Brown). Reviewed by W. B. Stallworthy.

The Achievement Motive, David C. McClelland *et al.* (Appleton-Century-Crofts). Reviewed by John F. Dashiell.

The Major Features of Evolution, George G. Simpson (Columbia Univ. Press). Reviewed by Carleton S. Coon.

Geography in the Twentieth Century, ed. 2, Griffith Taylor, Ed. (Methuen; Philosophical Library). Reviewed by George B. Cressey.

Communication and Persuasion, Carl I. Hovland, Irving L. Janis, and Harold H. Kelley (Yale Univ. Press). Reviewed by Richard W. Husband.

Psychologie, Grundlagen, Ergebnisse und Probleme der Forschung, George Anschütz (Richard Meiner). Reviewed by L. von Bertalanffy.

Readings in the Philosophy of Science, Herbert Feigl and May Brodbeck, Eds. (Appleton-Century-Crofts). Reviewed by Ralph Buchsbaum.

Standard Methods of Clinical Chemistry, Vol. I, Miriam Reimer, Ed. (Academic Press). Reviewed by Beverly L. Clarke.

Plane Trigonometry, Paul R. Rider (Macmillan). Reviewed by Wallace Givens.

Elementary Quantitative Analysis, Ralph L. Van Peursem and Homer C. Imes (McGraw-Hill). Reviewed by Clark E. Bricker.

Preparation for Medical Education in the Liberal Arts College, Aura E. Severinghaus, Harry J. Carman, and William E. Cadbury (McGraw-Hill). Reviewed by Alan Gregg.

Scientific American Reader, (Simon & Schuster). Reviewed by Bowen C. Dees.

Astrology and Alchemy: Two Fossil Sciences, Mark Graubard (Philosophical Library). Reviewed by Frank K. Edmondson.

The Journals of Lewis and Clark, Bernard De Voto, Ed. (Houghton Mifflin). Reviewed by E. Ashby Hammond.

New Books

Simultaneous Linear Equations and the Determination of Eigenvalues. Natl. Bur. of Standards Applied Mathematics Ser. 29, 1953. L. J. Paige and Olga Taussky, Eds. Distr. by Supt. of Documents, GPO, Washington 25, D.C. 126 pp. $1.50.

Inorganic Syntheses. Vol. IV. John C. Bailar, Jr., Ed. McGraw-Hill, New York, 1953. 218 pp. Illus. $5.

Biochemistry and Physiology of Nutrition. Vol. II. Geoffrey H. Bourne and George W. Kidder, Eds. Academic Press, New York, 1953. 641 pp. Illus. $15.

Clinical Orthoptic Procedure. ed. 2. William Smith. Mosby, St. Louis, 1954. 524 pp. Illus. $10.

Biochemical Preparations. Vol. 3. Esmond E. Snell, Ed. Wiley, New York, 1953. 128 pp. Illus. $3.50.

Table of Natural Logarithms for Arguments Between Zero and Five to Sixteen Decimal Places. Natl. Bur. of Standards Applied Mathematics Ser. 31, 1953. Distr. by Supt. of Documents, GPO, Washington 25, D.C. x + 501 pp. $3.25.

Nature and Structure of Collagen. Papers presented for a discussion convened by the Colloid and Biophysics Committee of the Faraday Society, March 26–27, 1953. J. T. Randall, Ed. Academic Press, New York; Butterworths, London, 1953. 269 pp. Illus. $6.50.

Bali: Temple Festival. Monographs of the American Ethnological Society, XXII. Jane Belo. J. J. Augustin, Locust Valley, N.Y., 1953. 70 pp. Illus. + plates. $2.75.

Mammalian Germ Cells. Ciba Foundation Symposium. G. E. W. Wolstenholme, Ed. Little, Brown, Boston, 1953. 302 pp. Illus. + plates. $6.75.

Detergency Evaluation and Testing. Jay C. Harris. Interscience, New York, 1954. 210 pp. Illus. $3.75.

Introduction to Chemistry. R. T. Sanderson. Wiley, New York; Chapman & Hall, London, 1954. 542 pp. Illus. $5.50.

Jaarboek, 1952–1953. Koninklijke Nederlandse Akademie van Wetenschappen. Noord-Hollandsche Uitgevers, Amsterdam, 1953. 347 pp. Illus. + plates.

Linear Operators. Richard G. Cooke. Macmillan, London; St Martin's Press, New York, 1953. 454 pp. $10.

Nuclear Moments. Reprinted in part from *Experimental Nuclear Physics,* Vol. I, E. Segré, Ed. Norman F. Ramsey. Wiley, New York; Chapman & Hall, London, 1953. 169 pp. Illus. $5.

Industrial Electronics. Introduction to modern industrial electronic practice. R. Kretzmann. Philip's Technical Library, Eindhoven, Netherlands, 1953. U.S. distr.: Elsevier Press, Houston. 236 pp. Illus.

Cationic Polymerisation and Related Complexes. Proceedings of conference held at University College of North Staffordshire, March 24–26, 1952. P. H. Plesch, Ed. Academic Press, New York, 1953. 166 pp. Illus. $4.

Silicified Middle Ordovician Trilobites. H. B. Whittington and W. R. Evitt, II. Geological Society of America, New York, 1953. 137 pp. Illus. + plates.

Advances in Carbohydrate Chemistry. Vol. 8. Claude S. Hudson and Melville L. Wolfrom, Eds. Academic Press, New York, 1953. 408 pp. Illus. $10.

Dimensional Methods and Their Applications. C. M. Focken. Edward Arnold, London; St Martin's Press, New York, 1953. 224 pp. $6.

Introduction to a Study of Mechanical Vibration. G. W. Van Santen. Philip's Technical Library, Eindhoven, Netherlands, 1953. U.S. distr.: Elsevier Press, Houston. 296 pp. Illus.

Crystal Growth and Dislocations. Ajit Ram Verma. Academic Press, New York; Butterworths, London, 1953. 182 pp. Illus. $5.

Les Groupes Sanguins Chez les Animaux. Individualités sanguine et tissulaire. R. Dujarric de la Rivière and A. Eyquem. Collection de L'Institut Pasteur. Éditions Médicales Flammarion, Paris, 1953. 407 pp. Illus. 3275 frs.

Rutley's Elements of Mineralogy. ed. 25. H. H. Read. Interscience, New York, 1947. 525 pp. Illus. $2.50.

Shock and Circulatory Homeostasis. Transactions of the Second Conference Oct. 19–21, 1952, Princeton, N.J. Harold D. Green, Ed. Josiah Macy, Jr., Foundation, New York, 1953.

Planning Guide for Radiologic Installations. Committee on Planning of Radiologic Installations of the Commission on Public Relations of the American College of Radiology, Wendell G. Scott, Chairman. Year Book Pubs., Chicago, 1953. xvi + 336 pp. Illus. $8.

Simuliidae of the Ethiopian Region. Paul Freeman and Botha de Meillon. British Museum (Natural History), London, 1953. 224 pp. Illus. £2 10s.

Das Elektrische Herzbild. Die Grundlagen Eines Neuen Elektrokardiographischen Verfahrens. Wilhelm Ernsthausen. Verlag Herman Rinn, München, Germany, 1953. 231 pp. Illus. DM 48.

The Sardinian Project. An experiment in the eradication of an indigenous malarious vector. John A. Logan. Johns Hopkins Press, Baltimore, 1953. 415 pp. Illus + plates $7.50.

Quantitative Organic Analysis via Functional Groups. ed. 2. Sidney Siggia. Wiley, New York; Chapman & Hall, London, 1954. 227 pp. Illus. $5.

Technical Papers

Purification of Plasma Thromboplastin Factor B (Plasma Thromboplastin Component) and Its Identification as a Beta$_2$ Globulin

Paul M. Aggeler, Theodore H. Spaet, and Byron E. Emery

Department of Medicine, University of California School of Medicine, and the Medical Service, Veterans Administration Hospital, San Francisco; the Department of Medicine, Stanford University School of Medicine, San Francisco; and the Cutter Laboratories, Berkeley, California

A previously unknown blood-clotting factor necessary for the production of thromboplastin in the plasma was discovered by Aggeler *et al.* (*1, 2*). In contrast to the antihemophilic factor, which serves a similar function, this factor is present in serum as well as in plasma, is stable on storage at refrigerator temperature, is completely adsorbed by barium sulfate, is present in the 45 to 50 percent saturated ammonium sulfate fraction of plasma rather than the 0 to 33 percent fraction, and is not present to any significant degree in fraction I of Cohn. This factor was named plasma thromboplastin component (PTC). Its characteristics have been confirmed by Biggs *et al.* (*3*), who called it Christmas factor, and by Soulier and Larrieu (*4*), who called it antihemophilic factor B.

Numerous reports of patients deficient in the new factor have now been published, and it is estimated that the disease may account for 10 to 20 percent of all patients thought to suffer from hemophilia. The disease has been found to be indistinguishable from hemophilia except by special laboratory procedures. Aggeler, White, and Spaet (*5*) have reviewed the relevant literature and have proposed a uniform nomenclature whereby this factor would be called plasma thromboplastin factor B (PTF-B) and the antihemophilic factor would be called plasma thromboplastin factor A (PTF-A).

Biggs *et al.* (*3*) found that PTF-B was contained in a crude ether fraction precipitated from plasma and consisting of alpha and beta globulins. White, Aggeler, and Emery (*6*) found it concentrated in fractions III and IV-1 of Cohn. Small quantities were found in fractions I and IV-4. None was found in fractions II or V.

White, Aggeler, and Glendening (*2*) prepared a potent PTF-B extract by adsorbing acidified serum with $BaSO_4$ and eluting the $BaSO_4$ with sodium citrate. In the present investigation, a modification of this process was used to obtain a purified extract from fraction IV. Here 100 mg of $BaSO_4$ per milliliter of 10 percent solution of the fraction was used for adsorption, and all elutions were accomplished into volumes of solutions equal to the original volume of the fraction. All adsorptions and elutions were continued for 30 min at 37°C. The $BaSO_4$ was separated from the supernatants by centrifugation at 2000 rev/min for 10 min. After the fraction IV was adsorbed, the supernatant was discarded. The $BaSO_4$ was eluted first with 0.1*M* sodium oxalate and then with 0.006*M* sodium citrate. These eluates were pooled (extract B). The $BaSO_4$ was then eluted with 0.34*M* sodium citrate (extract C) (*7*). These eluates were dialyzed against distilled water and then desiccated in a lyophilizer.

In the first preparation, made from 192 ml of fraction IV, the yield of solids was 500 mg in extract B and 78 mg in extract C. In the second preparation, made from 400 ml of fraction IV, extract B was discarded, and the yield of solids in extract C was 70 mg. The coagulating potency of these extracts was compared with that of normal plasma by testing their ability to shorten the coagulation time and to decrease the residual serum prothrombin (*8*) in patients suffering from PTF-B deficiency (Table 1). Extract B was inert, whereas both a 0.02 percent solution of extract C #1 and a 0.01 percent solution of extract C #2 were equal in potency to undiluted plasma.

The amount of extract C available was too small for accurate chemical analysis; however, an approximation of its protein content was made by eluting the bromphenol blue from an entire paper electrophoretic

Table 1. Comparative effects on clotting time and residual serum prothrombin of the addition of normal plasma and of extracts of plasma fraction IV in the PTF-B deficient patient.

Fraction added*	Concentration of solids in fractions added (g/100 ml)	Clotting time (min)		Residual serum prothrombin in percentage of patient's plasma volume†	
0.85% NaCl		23–33		72–78	
Normal plasma					
100%		8		10	
40%		9		20	
20%		9		31	
Fraction IV Extract B	4.0	32		83	
	0.8	28		67	
	0.2	26		77	
Fraction IV Extract C		#1	#2	#1	#2
	0.4	7	8	4	4
	0.08	8	8	4	3
	0.04	11	10	6	7
	0.02	12	9	11	7
	0.01	13	12	20	11
	0.005	15		47	
	0.0025	17		67	

* 0.1 ml of fraction added to 2.0 ml blood.
† Ware-Stragnell modification of Owren's method (*8*); blood incubated for 1 hr at 37°C after clotting.

pattern with 0.1 percent NaOH (see next paragraph). The eluate was compared with a standard albumin solution, similarly eluted, in a Coleman junior spectrophotometer at a wavelength of 575 millimicrons (575 mμ). It appeared that only about 10 percent of the material in the C extracts was protein. Four percent solutions of these purified extracts contained no measurable quantities of thrombin, antihemophilic factor, labile or stable prothrombin conversion accelerators. Only a trace of prothrombin was found. Thrombin was tested by the addition of 0.1 ml of extract to 0.1 ml of normal oxalated plasma. Coagulation did not occur within 4 hr at 37°C. Labile prothrombin conversion accelerator was tested by the method of Quick (*9*); stable prothrombin conversion accelerator by the method of Owren and Aas (*10*); and antihemophilic factor by the method of Spaet *et al.* (*11*). In these tests, the addition of the extract gave results similar to the saline controls. Prothrombin was tested both by the method of Ware and Stragnell (*8*) and by the method of Owren and Aas (*10*). An amount less than 1 percent of that contained in normal plasma was found.

Paper electrophoresis was accomplished by a modification of the method described by Kunkel and Tiselius (*12*), in which the paper strips were suspended between glass plates coated with silicone. The system was supplied with Veronal buffer at a pH of 8.6 and an ionic strength of 0.05. Whatman #3 MM filter paper was used, and runs were of 4-hr duration at a potential difference of 500 v. Fraction IV and extract B contained all the electrophoretic components found in normal serum, although the relative proportions were altered. Extracts C #1 and C #2 were composed of alpha$_2$ and beta globulins and, perhaps, traces of gamma globulin.

In a separate experiment, 0.01-ml specimens of 40 percent extract C #2 were run in duplicate, together with a serum control. In this study, the filter paper strip was marked off in transverse divisions 1 cm apart, and the current was applied until the albumin of the prestained serum had traveled 12 cm from the origin. A portion of the paper containing one of the extract C #2 specimens was then cut from the rest of the strip and divided into segments corresponding to the transverse divisions. Each segment was eluted for 15 hr into 0.5 ml of isotonic saline; 0.1 ml of each eluate was then added to 2 ml of freshly drawn whole blood from a patient with untreated PTF-B deficiency, and the residual prothrombin in the serum was determined 4 hr after clotting. The remainder of the strip was stained with bromphenol blue in the usual way.

Figure 1 shows the results of these studies. The activity of the respective eluates is shown below that of the corresponding segment in graphic form. The results are expressed in terms of the percentage of increased prothrombin utilization in the patient's serum induced by each eluate. The PTF-B activity was found to be concentrated in the beta$_2$ globulins by this technique, and it can be assumed that the minor activity exhibited by the beta$_1$ and alpha$_2$ fractions was due to diffusion. The deeply staining material at the point of origin is congealed protein that failed to migrate. Less than half the protein present appears to be beta$_2$ globulin.

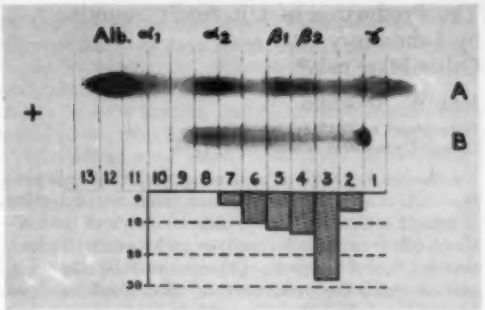

Fig. 1. Paper electrophoretic patterns of normal serum (A) and of extract C #2 (B). The PTF-B potency of the numbered segments contained in extract C #2 is shown in the lower graph. Potency is expressed in terms of the percentage of increased prothrombin utilization induced in the PTF-B deficient patient's serum by eluates from each segment of a parallel strip of extract C #2.

Since only about 5 percent of the total solids in the extract C preparations was beta$_2$ protein, and since the coagulating potency of extracts whose concentrations were 0.02 percent or less equaled the potency of normal undiluted plasma, the concentration of PTF-B in normal plasma is of the order of 1 mg or less per 100 ml. A favorable influence on blood clotting has been found for as long as 3 wk after transfusion of 500 ml of plasma in the PTF-B deficient patient weighing approximately 50 kg. This is in contrast to the disappearance of the AHF factor within a few days after a 500-ml plasma transfusion in a hemophilic patient of similar weight. The AHF concentration in normal plasma is unknown.

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The Production of Ultrasonic Sounds by Laboratory Rats and Other Mammals*

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Although it has long been recognized that bats produce ultrasonic sounds and use them for detecting objects at a distance (*1, 2*), little is known of the ability of other animals to produce such sounds. Indeed, insects (*3*) and porpoises (*4*) are the only other animals in which the production of ultrasound has been demonstrated. It is therefore of interest to record some observations on high-frequency sound production by other animals.

Certain audible sounds of wild mammals in the National Zoological Park and of guinea pigs were found to have appreciable components in the ultrasonic frequency range—above 20 kilocycles per second (20 kcy/sec). Laboratory rats, in addition to producing high-frequency components of audible sounds, have the ability to emit pure tones between 20 and 30 kcy/sec-sounds that have no audible component.

For this preliminary survey, a "sonic amplifier" (covering the range from 0 to 80 kcy/sec) similar to that described by Noyes and Pierce (*5*) was employed; its frequency scale was accurate within 1- or 2-kcy/sec, as determined by direct comparison with a Hewlett-Packard oscillator. For a more detailed study of the ultrasonic sounds of the laboratory rat, a condenser microphone, amplifiers, and cathode-ray oscillograph were used, as described by Griffin (*6*).

The audible sounds found to have appreciable ultrasonic or high-frequency components are summarized in Table 1.

* A part of this work was done at the University of New Hampshire, 1951–52. I would like to thank L. J. Milne and D. R. Griffin for their encouragement and helpful criticisms in the completion of this study. In addition, acknowledgment is due William Mann, the director of the National Zoological Park, for his cooperation in the sections of the study that were undertaken in the park.

In studying the high-frequency sounds produced by laboratory rats, I first noted that the loud squeals elicited by gently pinching a rat's tail had two prominent overtones, one at 19 and the other at 29 kcy/sec. From time to time, rats in their cages emitted short snuffling sounds with audible components, and these were found to contain overtones over the whole range of the instrument to 80 kcy/sec. In addition to these ultrasonic components of audible sounds, rats that were accustomed to the presence of the apparatus and the observer produced a whole series of sounds, ranging in frequency from 23 to 28 kcy/sec, and 1 to 2 sec in duration, which were not correlated with audible sounds. The frequency of these sounds often shifted rapidly by about 2 kcy/sec.

The ultrasonic sounds were clearly produced by the rats, for they disappeared when the cage of rats was removed from the room and returned when the cage was carried back into the range of the instrument. The prolonged duration of these sounds precludes their being merely ultrasonic components of slight noises associated with the rats' activity. Indeed, the sounds were observed when the animals were standing completely still and could be correlated with the animals' thoracic movements.

Recently these sounds were studied with a system consisting of a Western Electric 640-AA condenser microphone, cathode follower, voltage amplifiers, Spencer Kennedy variable electronic filters, cathode-ray oscillograph, and DuMont type 321 oscillograph record camera. This system was sensitive to frequencies from 10 to 100 kcy/sec, and accurate within 1 or 2 kcy/sec. Direct measurements of the frequency of the rat sounds from the film gave values ranging from 21.5 to 26.5 kcy/sec. The frequency modulation noted with the sonic amplifier was verified by these measurements, and the duration of the sounds was found to vary from about 1/30 sec to 2½ sec.

While the significance of these ultrasonic sounds of laboratory rats cannot be determined from these observations, it should be pointed out that the ability to hear sounds above 20 kcy/sec has been demonstrated

Table 1. Audible sounds with appreciable ultrasonic components.

Common name	Scientific name	Description of audible sound	Ultrasonic or high-frequency components (kcy/sec)
Flying phalanger	*Petaurus norfolcensis*	High "squir"	Up to 33
Squirrel monkey	*Saimiri sciureus*	High, variable	19
Cotton-headed marmoset	*Oedipomidas oedipus**	{ Squeal	19–23
White-armed marmoset	*Callithrix leucopus**	{ Long cry	36–39
Lion-headed marmoset	*Leontocebus rosalia*	High squeal; "squir"	10–22; 18–22, 27–28
Kina Balu giant rat	*Rattus infraluteus*	"Squir"	19–22, 33–37
Guinea pig	*Cavia cobaya*	Whistle; squeal	None; 29, 38, 54
Laboratory rat	*Rattus norvegicus*	Squeal; snuffling	19, 29; up to 80

* Individuals of these two species were housed in the same cage, and it was impossible to determine which of the animals were responsible for the cries.

by Gould and Morgan (*7*) for the laboratory rat, and by Schleidt (*8, 9*) for several small, wild rodents. In addition, Kahmann and Ostermann (*10*) have recently shown that hamsters when deprived of their vision can jump to a feeding stand without hesitation. These high-frequency sounds may serve for communication between individual rats; and it is also conceivable, though certainly not yet demonstrated, that rodents use high-frequency sounds for orientation in some manner comparable to the process of echolocation employed by bats.

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The Influence of Hydrocortisone on the Epithelial Phosphatase of Embryonic Intestine *in Vitro**

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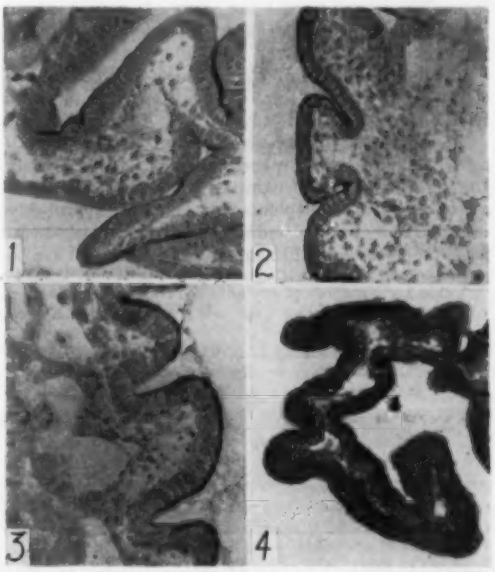
The high concentration of alkaline phosphomonoesterase characteristic of duodenal epithelium is accumulated, in both chick embryos and young mice, in short periods immediately preceding onset or change of digestive function (*1, 2*). In the mouse the accumulative phase is under the control of the pituitary-adrenal axis (*3*), and in the chick embryo *in ovo* duodenal phosphatase can be raised precociously to the hatching level by injection of cortisone (*4*). These studies bring into question the locus of action of the cortisone that was administered: does it affect the intestinal mucosa directly, or does it act indirectly, as for example by interfering with growth (*3, 5*) and thus enlarging the supply of raw material available for specific syntheses?

To determine whether exogenous corticoids can influence intestinal phosphatase concentration without the intermediation of other organs, fragments of the duodenal loop of 16-day chick embryos were raised *in vitro*. Each fragment was supported in a small piece of cellulose sponge (*6*) in a Maximov dish; the medium consisted of a drop of chicken plasma plus chick embryo extract, to which was added a tiny droplet of either saline or solution containing 0.05 gamma of hydrocortisone as free alcohol. The 16-day stage was chosen because it is the time at which the intestine acquires its maximal sensitivity to corticoids (*4*); hydrocortisone has been shown in this laboratory to be just as effective as cortisone in promoting intestinal differentiation. After 24 or 48 hr in culture, the fragments were fixed in iced 85 percent alcohol, embedded in paraffin, and sectioned serially at 7 microns (7 μ). Segments of each ribbon were stained with hematoxylin and eosin, or for phosphatase according to Gomori's current method (*7*).

In the hydrocortisone-treated fragments, the villi present at the time of explanatation were maintained without elongating, during the 48-hr period considered here, whereas in the controls they tended to shorten somewhat. Long, richly branched outgrowths (Figs. 1, 4) consisting of lamina propria covered by columnar epithelium were also produced, and these were more numerous and more elaborate in the experimentals than in the controls. The mucosa in general preserved a quite normal appearance between the muscular layer and the bases of the villi.

The epithelial cells clothing the surfaces of the cultures developed according to the normal pattern, growing progressively longer and narrower and the apical cytoplasm becoming increasingly dense; in both experimentals and controls, these events proceeded slightly faster than *in vivo*. The cut edges of the fragments became covered with an epithelium that sometimes remained squamous but often produced highly differentiated columnar cells. Although the differentiation appeared grossly normal in all series, close inspection of the 48-hr controls revealed in most



Figs. 1 and 2: control (1) and hydrocortisone-treated (2) explants, cultured 24 hr, incubated in phosphate medium 15 sec. Figs. 3 and 4: control (3) and hydrocortisone-treated (4) explants cultured 48 hr, incubated 10 min. (×440)

* This investigation was supported by research grant G-3937 of the National Institutes of Health, U.S. Public Health Service.

cases an excessive number of nuclei crowded together within a given length of surface. In pursuance of this observation, mitotic counts are now being made.

The activity and distribution of phosphatase were studied in sections incubated for 15 sec, 10 min, and 30 min in the buffer-substrate solution. Staining was limited to the nuclei of the lamina propria and to the cytoplasm, nuclei, and free border of the epithelial cells. Of these sites, only the border and cytoplasm showed any clear-cut differences according to the presence or absence of the hormone. These differences are summarized in Table 1, in which the stain intensity has been estimated by visual inspection: 0 means no stain; 1, occasional lightly-stained border patches or pale grey cytoplasm; 2, deeply but irregularly stained border or moderately grey cytoplasm; 3, solid black continuous border or blackened cytoplasm.

The striated border stained heavily after only 15 sec incubation in most of the experimentals (Fig. 2), but in the controls it stained irregularly or not at all (Fig. 1). After 10 min, the border stained deeply in most of the controls, although two of the 24-hr controls remained negative. Since the 15-sec reaction in the experimentals was about equivalent to that found in the borders of intact embryos of 17 or 18 days, it appears that the controls had failed to undergo the increase that normally occurs after 16 days.

Ten minutes of incubation produced some darkening of the cytoplasm of the epithelial cells of the hydrocortisone-treated cultures, some of which stained intensely (Fig. 4). In the *in vivo* controls of the same ages, the cytoplasm did not stain after 10 min and the reaction was also weak or negative in the explant controls (Fig. 3). After 30 min of incubation, the epithelial cytoplasm of the cultured controls became somewhat grey, but that of the experimentals was blackened.

These data show that hydrocortisone is able to promote accumulation of phosphatase by acting directly on intestinal tissue. Quantitatively the difference between the treated explants and controls is probably substantial, for correlated quantitative and histochemical studies indicate that only a large difference can be visualized (*2*). It is not clear, however, that the synthesis of the enzyme is entirely dependent on the hormone, for comparison of the cytoplasmic staining in the 24- and 48-hr controls suggests that some increase occurs in these too (Table 1), although there are not enough cases to prove this point. It has previously been shown that, even in explants from 14-day embryos, the border reaction increases slightly without addition of any hormone (*8*).

Table 1. Numbers of explants showing various degrees of phosphatase staining (see text). C = control; E = hydrocortisone-treated.

Region and stain time	Hours in culture		Stain intensity 0	1	2	3
Striated border (15 sec)	24	C	5	1	3	0
		E	0	1	1	9
	48	C	4	3	2	0
		E	1	0	1	9
Cytoplasm of epithelial cells (10 min)	24	C	7	1	1	0
		E	0	2	4	5
	48	C	4	2	3	0
		E	0	1	4	6

A previous report that adrenocorticoids decrease intestinal phosphatase *in vitro* (*9*) is not in conflict with our results, for the study was made on 13-day or 14-day tissue, which is not yet sensitive to corticoids *in vivo* (*4*), and employed culture conditions that permitted the epithelium to spread in sheets. Probably the maintenance of normal differentiation is essential to normal enzyme production, although our results do show that differentiation and enzyme synthesis may be partly dissociated, for on many of our explants we found areas where a strong border reaction had occurred on cells that were still cuboidal or had elongated only slightly. Further work now in progress in this laboratory is concerned with quantitating the present data as well as extending these studies to other aspects of total functional differentiation.

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Evaluation of Bone Density from Roentgenograms

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For years clinical roentgenologists and research workers have sought a method for precise, reproducible, roentgenographic determination of bone mineralization. An apparatus was described by Brown in 1951 (*1*), with which it is possible to obtain an accurate reading for bone density in the light of exposure and developing factors for the particular film. This consists of a modified densitometer, a function transformer, and recording, integrating, and counting devices.

Roentgenograms are taken with a specially designed, standardized, aluminum alloy wedge exposed in proximity to the bone under consideration as shown in Fig. 1. The standardized wedge and detailed instructions are available from our laboratory.

To determine the bone density from such a film, the

Fig. 1. A typical roentgenogram for bone-density evaluation.

first step is to produce a calibration curve by measuring the light transmitted through various points along the wedge image. The calibration curve so obtained is different for each film, owing to differences in exposure and developing. The function transformer is then set according to the calibration curve. When one measures the light transmitted through the bone image on the film, the result is computed automatically in terms of the calibration curve previously determined. This feature makes this method unique and reproducible.

The soft tissue surrounding a bone is a source of error (*2*), and we find that the soft-tissue mass must be determined by special computations to give a correct figure for bone density. Owing to this source of error, most of the applications of this technique have been limited to the phalanges, radius and ulna, and os calcis where soft-tissue corrections can be made quite accurately. We are currently investigating techniques that may eliminate soft tissue as a source of error.

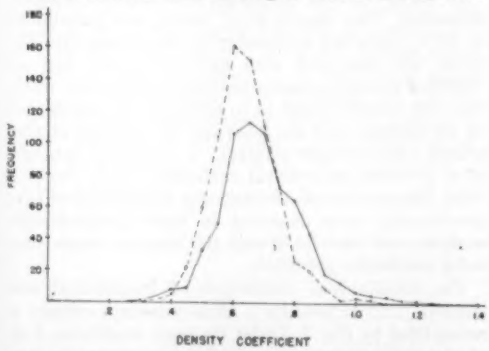

Fig. 2. Range of bone-density coefficients for the os calcis in approximately 1200 individuals. Frequency represents the number of times the stated value appears. The solid line represents males; the dashed line, females.

The bone-density results are computed and reported as an average of "density coefficient" for the particular bone evaluated. This density cofficient can be multiplied by a constant factor to find the density of the bone in grams of bone ash per cubic centimeter of bone.

Bone-density determinations from films from approximately 1200 "normal" persons of all ages and both sexes reveal a 2-to-1 range of variation in general (Fig. 2).

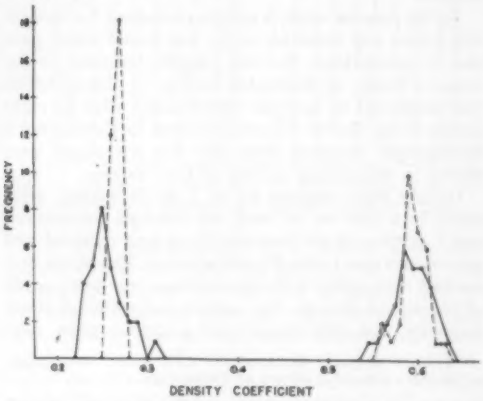

Fig. 3. Reproducibility of the technique. Frequency represents the number of times the stated value appears. The curve on the left is for the soft tissue near the os calcis; the curve on the right is for the os calcis. The solid line represents 30 films of one subject taken at 1-hr intervals; the dashed line represents 30 evaluations of one film in the same series.

It appears possible to divide "normal" human adults into approximately 10 classes of bone mineralization by this technique. At present, we are attempting to determine average bone-density coefficients for different sex and age groups.

The technique is highly reproducible, as is shown by Fig. 3. This graph shows the results of evaluating 30 films of one subject and 30 evaluations of one film from the same series. The reproducibility in the case of different films is on the order of 5 percent, which appears to be much more accurate than other known methods.

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Contraction of Circular and Longitudinal Guinea Pig Ileal Sections by Cholecystokinin Concentrates and Histamine

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During the course of a study of the contractility of smooth muscle by cholecystokinin concentrates isolated from hog intestines, the effect of such extracts and histamine on longitudinal, as well as circular, ileal fibers was explored. Magnus (*1*) observed that circular preparations free of ganglia are obtained by stripping off the longitudinal musculature from the small intestine of the cat. Recently, Evans and Schild (*2*) have reviewed and extended the usage of this method.

In the present work, a simple procedure for mounting guinea pig intestinal strips was found which gave rise to contractions that are roughly traceable to the circular fibers, as illustrated in Fig. 1. A wire frame was employed to hold the longitudinal strip at right angles to the line-of-force to the lever that contacted a kymograph. Surgical wire had the advantage over thread in minimizing curling of the intestine.

Guinea pigs, ranging up to 1 kg in weight, were killed by a blow on the head, the abdomen was incised, and a portion of the terminal ileum was removed and placed in warm Locke-Ringer solution. The lumen was washed thoroughly with the medium, use being made of trocar and syringe. One section was mounted longitudinally with silk thread, and a shorter piece (approximately 10 to 15 mm in length) was arranged with surgical wire as described in the preceding paragraph. Denervation of the tissues was not attempted.

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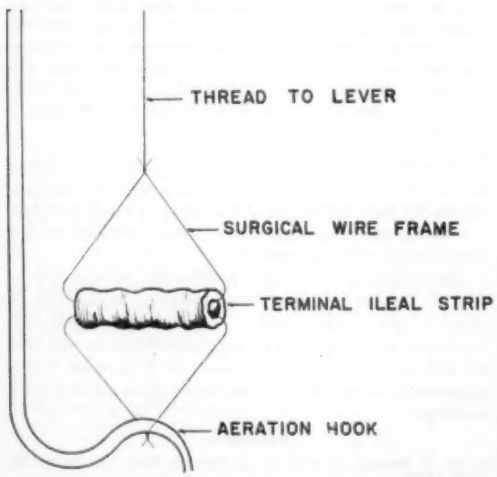

Fig. 1. Arrangement of the guinea pig ileal strip for the observation of circular fiber contractility.

Fig. 2. Contraction of longitudinal (top) and circular (bottom) ileal sections by 13 units of cholecystokinin concentrate, CCK-X2. The duration of each contraction is less than 1 min. (×2.5)

In all operations, the strips were handled with instruments. The muscle bath, which was maintained at 37°C, contained a chamber of 45 ml capacity. The latter was equipped with two inlets, one for air (bubbled through aqueous sodium bicarbonate), which was bent in such a way as to allow for the attachment of the sections, and the other for the entrance of preheated Locke-Ringer solution; a siphoning arrangement provided for removal or flushing out of the bath fluid. Cholecystokinin concentrates and histamine (hydrochloride) were dissolved in warm Locke-Ringer medium and introduced into the chamber when constant conditions prevailed.

The simultaneous contraction of longitudinal and circular preparations by a cholecystokinin extract is exemplified by Fig. 2. Under the same conditions, 5 μg of histamine gave rise to an off-the-paper contraction of the longitudinal segment; with the circular section, an augmented tonicity occurred. The circular, and especially the longitudinal, ileal preparations gener-

ally contract in a stepwise manner that is associated with increased tone when cholecystokinin extracts are introduced. Thus, of a total of 96 trials with 45 longitudinal preparations employing concentrates assaying 0.5 to 24 units/mg (*3*), 81 comprised stepwise or ragged contractions; latent periods often preceded an effect as reported earlier (*4*). Except for relatively few cases with low dosages, histamine caused the usual sharp and rapid longitudinal contractions, but the circular sections were either contracted in a stepwise fashion or displayed increased tonic activity.

Many circular segments proved to be refractory or of a very low order of sensitivity, often requiring massive dosages of potent cholecystokinin concentrates for an effect. Such intestinal strips are greatly affected by initial handling. It should be noted that the longitudinal preparation is able to contract over a greater distance than the circular ileal sections. In the latter, the diameter of the lumen is a limiting factor.

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The Effect of Insulin on the Oxygen Consumption of Mammalian Muscle*

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The first indication that insulin can stimulate the oxidation of carbohydrate was the work of Krebs and Eggleston (*1*) in which insulin was shown to increase the O_2 consumption of pigeon breast muscle brei in the presence of phosphate, citrate, and boiled muscle juice. Shorr and Barker (*2*) repeated and extended these experiments. On the whole, the stimulation was found to be far less—approximately 25 percent; and no effect at all was observed in minced skeletal muscle of the dog, cat, and rabbit, or in diabetic or fasted muscle of the dog. Stare and Baumann (*3*) likewise reported that insulin caused a 20-percent increase in the O_2 consumption of minced pigeon breast muscle, and a 60-percent increase in the O_2 consumption of muscle from depancreatized birds. Stadie, Zapp, and Lukens (*4*) corroborated the findings of Shorr and Barker but, contrary to Stare and Baumann, did not find any stimulation when they used minced muscle from diabetic pigeons and cats. Ricketts and Stare (*5*), however, reported that insulin in some cases stimulated the O_2 consumption of minced human diabetic muscle. Recently Stadie (*6*) has reviewed all aspects of this controversy.

* This investigation was supported by grant No. 112 of the Rutgers Research Council.

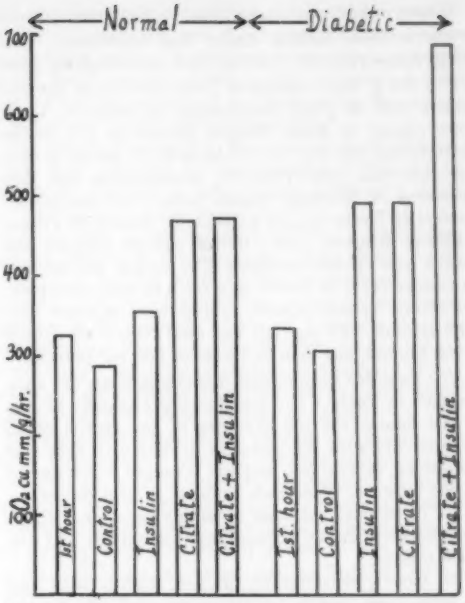

Fig. 1. Oxygen consumption in cubic millimeters per gram, per hour, in normal and diabetic muscle strips.

It is noteworthy that almost all of this work has been done with tissue minces, very little with relatively intact muscle. Moreover, Shorr and Barker (*2*) showed that the respiration of minced tissue differs greatly both quantitatively and qualitatively from that of tissue slices. Fisher, Hall, and Stern (*7*) reported that the O_2 consumption of intact isolated frog muscle was increased under certain conditions by insulin alone, under others when combined with citrate. More recently Villee and Hastings (*8*) have shown that pyruvate utilization and O_2 consumption are sharply reduced in diabetic rat diaphragm and that insulin when added *in vitro* remedies this condition.

Table 1. Data for normal and diabetic animals. All O_2 consumptions are in cubic millimeters per gram wet-weight, per hour.

	1st hour	Average 2nd and 3rd hours after dumping			
	All vessels	Control	Insulin	Citrate	Insulin and citrate
Normal	322 ± 6(24)	284 ± 7(27)	350 ± 5.3(21)	467 ± 7(27)	471 ± 6(23)
Diabetic	340 ± 7.3(29)	302 ± 8.5(34)	491 ± 7(28)	487 + 6.5(26)	685 ± 8.3(33)

Biopsy samples of normal and diabetic muscle were removed from rabbits under dial anesthesia. Thin strips approximately 1/16 in. thick and weighing from 0.2 to 0.4 g were separated from the biceps femoris muscle with as little fiber damage as possible. These were placed in Krebs Ringer phosphate (*9*) in the refrigerator for 1½ to 2 hr in order to insure a resting metabolic rate. Their O_2 consumption was then measured in Warburg vessels under four conditions: control of Krebs Ringer phosphate; insulin (1 IU per milliliter Ringer) (*10*); 0.01*M* sodium citrate; and insulin and citrate combined. The muscle was allowed to respire for 1 hr before and for 3 hr after dumping. To obtain diabetic muscle, rabbits were injected (*11*) with alloxan (300 mg/kg) and used after 1 wk if their blood glucose was then in excess of 300 mg percent.

The data for normal and diabetic animals are summarized in Table 1 and are shown graphically in Fig. 1. All figures are the averages of the results of 15 experiments with the standard deviation in each case appearing in brackets and the standard error quoted as the ± figure. These data indicate several things:

1) There does not seem to be any significant difference between the O_2 consumption of normal and diabetic muscle.

2) The O_2 consumption falls off slightly with time in both cases, but in neither is this fall significant.

3) The effect of insulin varies between normal and diabetic muscle. In the former there is an apparent stimulation of approximately 22 percent, which, however, is not statistically significant. In diabetic muscle, however, the O_2 consumption is increaesd by 63 percent of the control rate, which *is* significant.

4) Citrate has the same effect in both cases—a significant stimulation of the O_2 consumption of better than 60 percent of the control rate in each case.

5) Insulin in the presence of citrate has no effect on normal muscle. It appears, therefore, that in this case citrate and not insulin is the limiting factor. In diabetic muscle, however, the insulin and citrate combination increases the O_2 consumption by 127 percent of the control rate—a further increase of 66 percent over that caused by citrate alone.

The foregoing data indicate a real difference in the response of normal and diabetic muscle to insulin. The O_2 consumption of normal rabbit muscle slices is not affected by insulin. The O_2 consumption of diabetic rabbit muscle slices, on the other hand, is increased more than 60 percent by insulin, either alone or in the presence of citrate. Further investigations of this action of insulin are being carried out.

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Communications

"Myiasis" Resulting from the Use of the Aspirator Method in the Collection of Insects

During the past two summers I have served as research entomologist at the Arctic Research Laboratory, Point Barrow, Alaska. Since the insect fauna is composed largely of small-sized insects, such as gnats, midges, anthomyid flies, rove beetles, Collembola and wasps parasitic upon the flies, considerable use was made of the aspirator method of collecting. Apparently because of the use of the aspirator, a most unique case of "myiasis" (or infestation) occurred.

The aspirator, an apparatus generally designed to collect insects by suction, consists of a vial into which is fitted, by means of a stopper, two pieces of copper tubing, one of which is directed toward the insect and the other is attached to a length of rubber tubing, which during use is placed in the operator's mouth. Across the end of the copper tubing leading to the operator's mouth a fine mesh brass screen is secured. This, of course, is to prevent the aspirated insects from being drawn out of the vial and yet provide a free airway between the insect being aspirated and the operator. This apparatus has been widely used by entomologists, particularly the dipterists, for the collection of insects that are not so readily collected by other means.

Approximately 2 mo after the completion of the past summer's work at Point Barrow I became ill. During the week following the onset of illness four major groups of insects (Coleoptera, Collembola, Diptera, Hymenoptera) were passed alive from the left antrum of the sinus. These insects included three adult rove beetles (Staphylinidae), *Micralymna brevilingue* Schiødte; 13 fungus gnat larvae (Mycetophilidae), *Boletina birulai* (Lundstrom); three egg parasitic wasps (Mymaridae), *Mymar* sp.; and about 50 springtails (Collembola), *Isotoma olivacea* Tullberg. The medical aspects, as well as the specific identification of the insects involved, are to be reported by Donald G. Casterline, M.D. [*Calif. Mo. Medicine*, in press].

At Point Barrow I was engaged in studies that made it necessary to obtain both qualitative and quantitative data on the insect fauna. Thus, in order to follow the seasonal progression of this fauna, composed essentially of small-sized insects, daily periods of aspiration approximated 4 to 6 hr. It is believed that these protracted periods of daily aspiration during the summer contributed to a case of "myiasis" that is without parallel in its origin and nature. Insofar as I have been able to ascertain none of the insects reported herein have been previously shown to cause "myiasis" in man.

Since it is likely that the aspirator will continue to be an important means for the collection of small-sized insects, I would like to suggest that those persons who utilize this apparatus so modify it that the flow of air will not be toward the operator's mouth. Apparently the insects gained access to the sinus as eggs which passed through the fine mesh brass screen. Admittedly, it is almost unbelievable that the insects should have undergone several stages in their metamorphosis within the sinuses, but since the screen was so fine as to preclude the possibility of the aspiration of adult insects, it must be concluded that such was the case.

PAUL D. HURD, JR.
University of California, Berkeley

Received May 7, 1954.

Nuclear Emulsions for Electron Microscopy

In our recent article [*Science* **119**, 441 (1954)] describing the use of Ilford nuclear emulsions in gel form, we should have given the number of the emulsion as G-5 rather than C-2. As a matter of interest, Ilford Limited, (Ilford, London, Eng.) will supply the C-2 as well as other nuclear emulsions in gel form upon request.

J. J. COMER
S. J. SKIPPER
The Pennsylvania State University, State College

Received May 6, 1954.

Scientists' Definition of Public Relations Not Scientific

In a recent issue of *Science* [**118**, 420 (1953)] there was an excellent article on "Science and public relations" by Herbert Curl and Nicholas Rescher of the Marine Corps Institute. The introductory paragraphs and such phrases as "science cannot afford the risks of isolation or misunderstanding" were well put. The half-dozen illustrations, which "have a portentous aggregate effect," accurately portrayed some segments of the total problem—lack of effective two-way communication between the nonscientist and the scientist.

Some general suggestions were made to improve the situation. First, emphasis was placed on the role of the individual scientist in his community by taking full advantage of his nonscience contacts to improve the public regard for science's contribution to society. Curl and Rescher's key solution lay in "the formation of a single, nonprofit, non-Government institute, without partisan political affiliations, whose sole aim would be the improvement of the public relations of science." This was advocated to "best utilize the power of effectively coordinated information."

Unfortunately, however, the description of this institute was followed by this statement: "It should employ the tools of modern public relations without succumbing to its methods or aims."

As one who is dedicated to helping interpret the medical sciences to the American public and one who is intent on helping build up the professional status of public relations, I dislike the phrase "without succumbing to its methods or aims." I believe that, to most scientists this phrase reads: "We do not believe in newspaper headline grabbing or publicity stunts (methods) as a means of giving the scientific world and its personnel undue popularity (aims)."

We must first differentiate between the general use of the term "public relations" and its application to the duties of "public relations" personnel. Actually, there is no necessary connection. The first has come to mean to do what is good, intelligent, kind, courteous, and appropriate. The second refers to the task of writing, exhibiting, speaking, and so forth, or to use a more inclusive term, communicating.

Just as the scientist makes sure that his findings are accurately, honestly, and truthfully communicated to his associates and placed in the literature, so the public relations man seeks to convey accurately to the public the concepts, disciplines, successes, problems, and workings of science. Such information will contribute to the understanding on the part of people for the role of true science in today's society.

As science seeks the aid and assistance of competent public relations people, the latter are duty-bound to promote the use of such communication channels and techniques as are acceptable to the scientific world. In other words, public relations activities in science *are not* being handled properly if they do an injustice to the concepts and disciplines that have made science an important contributor to society's welfare. This fact constitutes the greatest challenge to public relations personnel working in the sciences.

A balanced approach to the problem of communicating science and its role to the masses will ultimately be found when education, research, and medical centers throughout the nation approach the problem as industry is doing—that is, by developing communications at the local or community level. A national institute will aid in telling the story of science, but obviously a grass-root approach at every center where there is a concentration of scientists will do what a national organization cannot. A local community program can and should include internal communications within the institution, guided tours for selected groups, speakers' bureaus, open-house events, external publications for the nonscientist, exhibits at public libraries and county fairs, and localized TV, radio, and press features.

Success of such a program, however, is dependent on the willingness (i) of the scientist to communicate, and (ii) of the public relations man to adjust his promotive characteristics to the disciplines of science.

Effective public relations *is not* so much a matter of headline grabbing and photographic tricks as it is of advancing the welfare of a cause by identifying its objectives with the public good and telling its story to people, with the sole intent of ultimately bringing its benefits to more people.

By employing the techniques of modern communications and espousing the aims of good public relations, science can and will bring its benefits to more people.

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Received April 7, 1954.

Thermal Precipitation Analyzed

I read with considerable interest the communication of B. W. Wright (*1*).

It would be difficult for us to measure directly the amount of heat transferred to the cold plate, since there is very little change in the temperature of our cooling water. Also, owing to losses to the surroundings, the amount of heat utilized is only a fraction of the power input. However, we can arrive at a figure for the required power input from a conductivity calculation. If suitable values are inserted into the conductivity equation, $Q = kA\Delta t/x$, where Q is the amount of heat transferred, k is the mean thermal conductivity of air, A is the area of the heated surface and $\Delta t/x$ is the temperature gradient, the value obtained for the power input of a typical run was 6.1 w. The total electric power input was 78 w. This run was with MgO smoke at 600 ml/min, a spacing of 0.010 in., and gave a deposit 3.9 cm in diameter.

I have derived an equation that describes the operation of this type of precipitator by utilizing the equation for the thermal force given by Epstein (*2*) and confirmed by Saxton and Ranz (*3*). Making a force balance on a particle that is being acted on by a viscous drag force, a gravitational force, and a thermal force, I arrive at the equation for the case of the precipitators described by Kethley *et al.* (*4*) and Wright,

$$\frac{q}{\pi s(s+2r)} = \frac{D_p(\rho_p - \rho)g}{18\mu} + \frac{3}{2}\left(\frac{R\mu}{MP}\right)\left(\frac{k}{2k+k_p}\right)\frac{\Delta t}{x}, \quad (1)$$

where q = volume rate of flow, s = length of deposit (= radius of deposit − radius of inlet opening), r = radius of inlet opening, D_p = diameter of aerosol particle, ρ_p = density of aerosol material, ρ = density of gas, g = gravitational acceleration, μ = viscosity of gas, k = thermal conductivity of gas, P = gas pressure, k_p = thermal conductivity of aerosol particle, R = gas constant, $\Delta t/x$ = thermal gradient between hot plate and cold plate, M = molecular weight of gas.

It should be noted that Eq. (1) is of the form

$$V = A + B\Delta t/x,$$

where V is a function of the precipitator geometry and aerosol flow rate, A represents the component of the particle motion attributable to gravity, and $B\Delta t/x$ is the component due to thermal force. In practice, we plot the left-hand member of the equation against the temperature gradient and get a series of points that approximate a straight line for aerosols of the same material and size distribution.

The reason good correlation of performance with power input has been obtained by Wright and others is that, to a large extent, the power input is a function of the thermal gradient.

Examination of the equation also indicates that the performance of a thermal precipitator depends on the absolute temperature of the system only to the extent that the thermal conductivities of the gas and aerosol material and the gas viscosity depend on the absolute temperature.

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The Fungistatic Action of Squalene on Certain Dermatophytes *in Vitro**

Squalene is an unsaturated triterpenoid hydrocarbon that was originally isolated from the liver oil of the shark (*1*). Among its other occurrences, it was found to be present in the fat from ovarian dermoid cysts (*2*). It has also been found in normal human sebum (*3, 4*).

An investigation was undertaken in order to learn whether squalene might exert a protective action on skin. This could come about because squalene, which has the consistency and appearance of mineral oil when pure, rapidly takes up oxygen on exposure to air and forms a yellow viscous oil with a high peroxide content.

It was found that undiluted squalene (*5*) on the surface of Sabourand's agar prevented multiplication of *Microsporum mentagrophytes, M. audouini* (*6*), and *M. tonsurans* (*6*). Undiluted mineral oil under the same conditions did not inhibit growth. In the case of *M. gypseum* (*6*), squalene inhibited growth in some instances, partially in others, and at times not at all. Squalene caused no inhibition of the multiplication of *Aspergillus terreus*.

Some evidence suggests that squalene exposed to air for a time prior to use may be more effective in inhibiting growth than pure squalene. These observations suggest that squalene may be a protective agent on the skin. It is hoped that this communication will stimulate clinical investigation of this material.

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The Tetrazolium Reaction in Yeast

In studies dealing with phytotoxic effects of hydrocarbons, the use of yeast as test materinl was suggested by Collander and Äyräpää (*1*), who outlined a simple permeability experiment suitable for laboratory or for class demonstration. Neutral red was employed as a penetrating indicator.

Under the appropriate conditions, yeast absorbs the vital dye 2,3,5-triphenyltetrazolium chloride (TTC) and reduces it intracellularly to a red formazan (*2*, *3*). Dead cells, following exposure to lethal concentrations of benzene, do not react. A simple demonstration of two factors related to vital TTC reduction is the following.

A quantity of wet compressed yeast cake is mixed with an equal weight of water, and 1 ml of the suspension is added to 100 ml each of the following four solutions. All contain 0.1 percent TTC and 0.01*M* phosphate buffer *p*H 7.6. In addition, the following are present: in 2, glucose 1 percent; in 3, benzene 0.1 percent by volume; in 4, glucose 1 percent and benzene 0.1 percent. The stoppered bottles are agitated from time to time.

Within about 5 min following addition of yeast, bottle 4 should be perceptibly pink, followed by 2, 3, and 1. In about 40 min, bottles 1–4 should show an increasing redness. Longer times will intensify the color but will decrease the differences. Strong illumination is undesirable, since it tends to reduce the dye photochemically outside the cells. A control bottle containing solution 4 but no yeast remains colorless.

The following interpretation of these results is suggested. Tetrazolium normally penetrates the yeast cell slowly. Benzene, through its lipid solvent action, increases permeability to the dye. This explanation finds support in the work of Hurst (*4*). Water that is 95-percent saturated with benzene is lethal to yeast in 8 hr at 25°C, but the approximately half-saturated solution used in these tests does not seem to be injurious. Sugar provides substrate for respiratory enzymes involved in the reduction of TTC. Yeast diaphorase is believed important in this regard (*5*).

That the cells were alive in all treatments after 1 hr was shown microscopically by a characteristic neutral red accumulation, by plasmolytic response to strongly hypertonic solutions, and by colony formation on grape-juice agar.

The question arises whether the action of benzene might not be one of increasing respiration. To obtain information on this point, oxygen uptake of yeast was determined by Warburg's direct method. At eight different concentrations of benzene, increasing from 7 to 83 percent of saturation, there was no significant effect on oxygen consumption within 1 hr. In saturated solution, however, the rate was 22 percent of the control. Further tests utilizing Dixon-Keilen flasks provided a measure of both O_2 and CO_2 exchange. A similar inhibition in saturated benzene solution was obtained, depressing CO_2 production more than O_2 absorption.

The foregoing considerations favor the interpretation that the benzene effect is an enhanced permeability toward TTC. Whether benzene increases permeability toward sugar at the same time, or whether sugar itself increases permeability, cannot be decided on the basis of these tests. The action of benzene is nonspecific, and the same effect is produced by other relative nonpolar substances, for example, ethyl ether, xylene, and 1-octanol.

In addition to laboratory use, these observations may have a bearing on the use of the tetrazolium reaction as a criterion of vitality. It has been noted that for certain cells (*6*) failure of TTC to penetrate constitutes a limitation.

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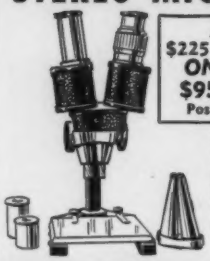

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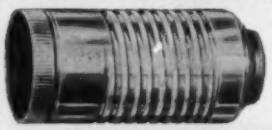

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The Astronomical League

A New Associated Society of the American Association for the Advancement of Science

THE Astronomical League, established in 1946, is a federation of amateur astronomical societies. At present it numbers 77 clubs comprising more than 4000 members. Included in this membership are a few junior organizations, but many of the larger groups maintain junior membership in addition to the regular membership. Members-at-large are individuals living in communities that have no organized society; there are 20 such members, some outside the United States.

The aims and purposes of the League, as stated in the by-laws, are (i) to promote the science of astronomy; (ii) to encourage and coordinate activities of amateur astronomical societies; (iii) to foster observational and computational work and craftsmanship in various fields of astronomy; (iv) to correlate amateur activities with professional research.

The League publishes a *Bulletin* five times annually in which items of astronomical interest, as well as programing aids, are brought to the attention of members. An observing manual is in preparation; it will combine in one volume the suggested methods for accurately observing and reporting to appropriate agencies the principal astronomical objects visible with relatively small equipment.

There is a Junior Activities Section, which assists in the organization of junior clubs and coordinates the activities of junior members through the *Junior Astronomer,* published in 10 issues a year.

Additional sections provide assistance on instrumentation, group projects, and available astronomical films. A Book Service is maintained for the purchase of books at a discount for members.

In addition to its observational and organizational functions, the League promotes public interest in support of the relatively small number of professional astronomers. We believe that this contributes in no small measure to the growing public interest in the science and brings support to the work of professional astronomers.

Functionally, the League is divided into regions, each of which comprises one geographic portion of the country. Each region operates under an organizational structure similar to that of the national body. At present there are seven such regions functioning: Middle East, Mid-States, North Central, Northeast, Northwest, Southeast, and Southwest. A few member groups are outside the present regional boundaries.

The League holds an annual general convention, and each region holds its own annual regional convention. At these meetings, papers are presented by leading amateurs and professionals on various aspects of astronomy. Reports are made of the various observational programs carried on under the direction of section chairmen in conjunction with the national observing societies, such as the American Association of Variable Star Observers, the Association of Lunar and Planetary Observers, and the American Meteor Society. Proceedings of each general convention are published and are made available to members; they may also be purchased by interested individuals.

The site of the general convention is rotated throughout the regions. The 1954 convention will be held in Madison, Wis., July 2–5; plans are being made to observe the total solar eclipse of June 30 prior to the convention. In 1955 the general convention will be in Seattle, Wash.

Current officers are president, R. R. LaPelle, R.D. 3, Meadville, Pa.; vice president, James H. Karle, Portland 19, Ore.; secretary, Russell C. Maag, Sedalia, Mo.; treasurer, Mrs. Ralph N. Buckstaff, Oshkosh, Wis.; executive secretary, Grace C. Scholtz, 166 Mason Hall Apts., Alexandria, Va.

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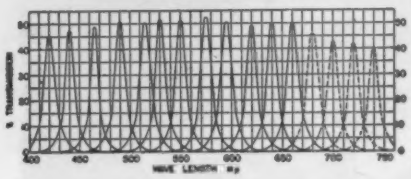

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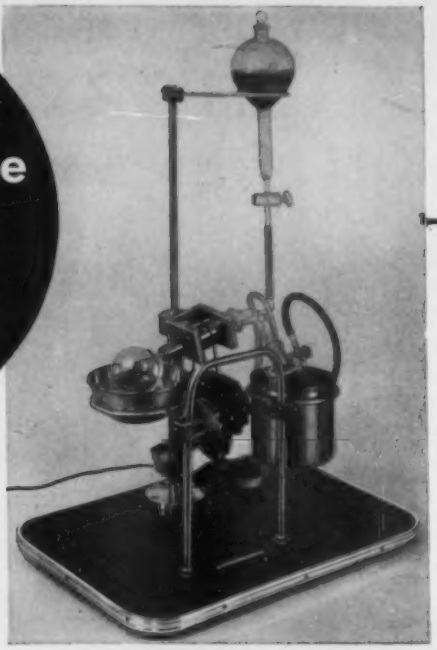

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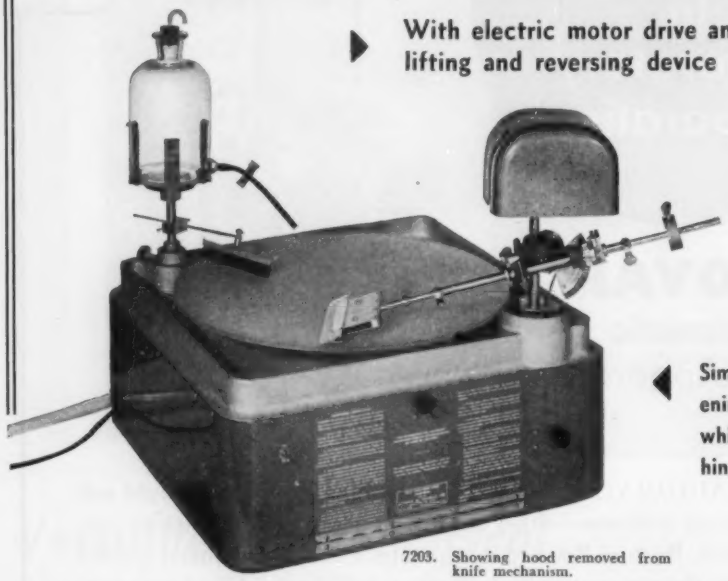

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7203. Showing hood removed from knife mechanism.

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